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BLOCKADE

KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ë	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
î	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
t̃h	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″(secondary)	accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

B

BIRDS OF PARADISE, or **PARADISÆIDÆ**, a family of birds of New Guinea, northern Australia, and the neighboring islands, which contains a large number of species, notable for splendid plumage, although they are most nearly allied to the plainly dressed crows. The name «bird of paradise» is a translation of the native name in the island of Batchian, «manukdewata,» meaning birds of the gods. About 50 species of these birds are known, varying in size from that of a crow to that of a sparrow; all are forest birds, spending their lives in the tree-tops, where many of them go about in small flocks, active and noisy, but are inclined to hide themselves in the thickest foliage, as though aware that their plumage rendered them easily conspicuous to their enemies. None are singers, and in most cases the voice is a loud, harsh cry, or a sharp whistle, or in some species, strange mewing notes. It is related that on some of the islands certain species were called «birds of the sun,» because of their habit of joining in loud choruses at sunrise. Their diet consists mainly of fruit, and especially of berries and seeds; the fig and the nutmeg are especially eaten, and some species suck honey from the large tropical flowers. Insects are captured by all species, as also are the numerous snails inhabiting the trees and bushes of that region, and the larger forms devour frogs and lizards. In pursuit of insects, worms and snails, several species spend much of their time scrambling about the trunks of trees and searching the bark, like creepers. The breeding habits of these birds vary extensively, and the nests and eggs of many have not yet been discovered. The typical paradise-birds construct rather loose, careless platforms of sticks and leaves, moss, etc., placed in trees or bushes, and lay eggs which are much streaked and spotted, and vary in color and patterns. The very extraordinary nests and play-grounds of that section of the family which is terrestrial, and inhabits Australia, are described under bower-birds (q.v.). Many recent authorities place these in a distinct family, the Ptilenorhyncidæ.

Interest in the birds of paradise centres in their marvelous displays of plumage. These are exhibited in most species by the male alone, the female being comparatively plain and simple in her attire, as also are the young of both sexes, until the young males arrive at maturity. This dissimilarity between the females and males of birds, of which the latter are highly adorned, is a protective arrangement, designed to keep the females from observation while they are sitting defenseless upon their nests, where they would easily be discovered, and often killed, did they wear the conspicuous colors and ornaments of their brilliant mates. Natural selection, by keeping their colors, and those of the inexperienced and comparatively helpless young ones plain, has tended to preserve the species; and at the time when the females are brooding their mates remain at a discreet distance from the nests, so as not to betray their position to the monkeys, lemurs, civets, serpents and other searchers for eggs and fledglings. The same influence, acting through sexual selection (q.v.), has developed in the males the bright colors and eccentric adornments which distinguish this group of birds as a means of increasing their attractiveness in the eyes of the females. The theory is that the most beautiful male will be chosen first as a mate, and will transmit to its offspring its tendency toward ornamentation or high color, and that thus, by constant rivalry between the males, the excessive ornamentation in this group has slowly arisen. A justification for this view is found in the fact that in the courting season, which occurs at the opening of the rainy season, numbers of males of each species gather in certain spots, sometimes on the ground, but more usually on the limbs of the forest trees, and go through a great variety of movements and strange antics, lifting their wings, spreading their tails, erecting their crests and apparently doing everything in their power to display their finery in the eyes of the females, and thus solicit them to make a choice. Natives call these assemblages, which usually occur at sunrise, and always in the same place, «dancing parties,» and it is during this time that they secure specimens for the trade, by shooting them from ambush with blunt arrows. So persistent has been the demand for their skins and feathers, chiefly for millinery purposes, that many of the species have been nearly exterminated. This may easily occur from the fact that the range of most of the birds of paradise is very limited, several species being confined to a single island. Their increase, too, is slow, as most of them lay only two or three eggs, a condition which has arisen from the fact that their natural enemies are comparatively few. They have occasionally been captured alive, and kept for a time in captivity, even in the zoological gardens of Europe, but they do not thrive in confinement. The best-known of the birds of paradise is the great emerald paradise bird (*Paradisea apoda*) of the Moluccas which was brought to Europe first in 1523, by the members of Magellan's company, on their return from the first circumnavigation of the world. They brought two dead specimens which had been given to them in the island of Batchian as a mark of royal favor. From these skins the natives, as was their custom, had cut off both the wings and the feet; and this gave rise to the absurd stores of the early books, that the paradise-birds were naturally footless and wingless, never perched, suspended themselves by the tail-feathers, etc. It was also said that they gazed perpetually at the sun, and that the hen laid her eggs on the back of her spouse. This species is as large as a crow. The male is rich brown, becoming purplish beneath; the head and neck are pale yellow, the forehead, cheeks and throat metallic green. From the sides of the body, beneath the wings, spring thick tufts of delicate, loosely-webbed, golden-orange feathers, which, when the wings are lifted, may be lifted and spread out so as to seem to fall like a shower over the whole bird; and the two middle tail-feathers are like long wires each with a very slight flag-like web at the tip. It would be impossible to describe at length the great variety and splendor of the plumage of these eccentrically ornate birds, only a few of which may be further alluded to. In the red bird of paradise (*Paradisea sanguinea*) the plumage is like velvet in a variety of gorgeous colors, and the tufts in the sides are rich crimson, while the elegantly curling central tail-shafts are 21 inches in length. A genus of New Guinea (*Cincinnurus*) includes a number of species, only about six inches long, called the king birds of paradise, which are distinguished by large tufts of fan-like plumes on each side of the breast. Another genus (*Parotia*) has as its especial ornament a group of three long feathers springing from behind each eye, which are in the form of metallic wires, with a racket-like web at the end that may be erected and moved about as the bird wishes. Otherwise the plumage is black, except for some vivid steel-green and white feathers about the head. Some species have a distinct shield of metallic, scale-like feathers upon the back or upon the breast, which may be glossy blue, or green, or violet, or glowing scarlet, or a mixture of these. The acme of this strange and gorgeous development in plumage seems to be attained by the «superb» bird of paradise (*Lophorhina superba*), which is characterized by the presence of an enormous erectile forked shield of velvety black feathers arising from the nape of the neck, and when in repose lying flatly on the back. So strange and apparently incongruous is this shield, that it might suggest to the beholder that the tail of some other bird had been stuck on to the skin, were it not that its feathers are of a different type. The ground-color of the plumage is of the deepest black, but with bronze reflections on the neck; while the feathers of the head are metallic green and blue. Spreading over the breast is a shield composed of narrow and rather stiff feathers, which extends in a pointed form, along each side, and is emarginate in the middle. In color, this is bluish-green, with a satiny sheen; the back shield, on the other hand, is velvety black, with reflections of bronze and purple, its outermost feathers exceeding the primaries of the wing in length. The natives say that the enormous crest, when displayed during the courtship of the female, is not only raised, but spread widely out, in a fan-like manner, while the chest shield is similarly expanded. Hence the head of the bird forms a circle of irregular feathers of velvety black and emerald, completely concealing the rest of the body when viewed from the front.

The name, «bird of paradise,» has also been applied to *Miluvius forcatus*, the «scissor-tail» of Central America, Mexico and some of the Southern States.

General information as to the birds of paradise will be found in books of East Indian travel, especially in ‘The Malay Archipelago’ (1869), by Alfred Russell Wallace, the first naturalist to study these birds attentively in their native haunts. As early as 1873, Daniel Elliot completed a magnificent monograph of the family illustrated with colored folio plates, and in 1881 was published a second monograph, by Salvatori, as a part of his general work on the ornithology of the Papuan region. Still more recently German naturalists have increased our knowledge of this family by many papers in German scientific periodicals, which have been utilized by Rothschild in the preparation of his account of these birds in ‘Das Tierreich’ (Berlin 1898). The most recent sketches are those of the ‘Royal Natural History’ (London 1895), and Evans, ‘Birds’ (London 1900). See also an article by A. Menegaux in the *Revue Française d'Ornithologie,* Year V, No. 48.

BIRDS OF PREY. This group is a survival of the old-fashioned classification of animals by resemblances in appearance and function, rather than in structure. Broadly speaking, a bird of prey is merely one which subsists by attacking and devouring living creatures, and hence the name covers such birds as skuas, frigate-birds, shrikes and fish-catching birds, as well as the eagles, hawks and owls, to which it is restricted by popular usage. In all these cases the adaptations are for a predatory life, especially marked in the strong seizing talons of the hawks and owls, and in their hooked, sharp-edged beaks, suitable for tearing and cutting, along with which go suitable modifications of the digestive organs, characteristic of the accipiters. These adaptations bear a curious, yet natural, likeness to the claws, teeth, etc., of carnivorous mammals and reptiles.

BIRDSBORO, Pa., borough of Berks County, 10 miles southeast of Reading, on the Pennsylvania and the Philadelphia and Reading railroads. Its industries comprise extensive foundries and machine shops. Pop. 3,299.

BIRDWOOD, Sir **George** (Christopher Moleswortн), English scientist: b. Belgaum, Bombay, 8 Dec. 1832; d. 27 June 1907. He was graduated at Edinburgh University, joined the Bombay medical staff in 1854, served in the Persian Expedition of 1856–57, and was sometime professor in the Grant Medical College, Bombay. He also acted as a commissioner at important exhibitions after 1851. He was author of ‘Economic Vegetable Products of the Bombay Presidency’ (1868); of numerous reports on botanical subjects, and of introductions to various historical and other works on India.

BIRDWOOD, Herbert Mills, English lawyer: b. Belgaum, Bombay Presidency, 29 May 1837; d. about 1908. He was educated at Edinburgh University, and was dean of arts (1868, 1881, 1888, 1890) and syndic of the Bombay University, and vice-chancellor 1891–92. He entered the Bombay civil service 1858; was made assistant collector and magistrate 1859; assistant judge 1862; under secretary to the government, judicial, political and educational departments, and secretary of the legislative council 1863; acting registrar of the High Court, Bombay 1867; district judge for Ratnagiri, Surat and Thana, 1871–80; judicial commissioner and judge of the Sadar Court, Sind 1881; three times acting judge of the High Court, Bombay 1881–85; puisne judge of the High Court of Bombay 1885–92; and member of the executive council of the governor of Bombay 1892–97. His publications include ‘Catalogue of the Flora of Matheran and Mahableshwar’; ‘Catalogue of Bills Introduced into the Bombay Legislative Council in 1862–65’; and papers relating to the constitution of the council, the plague in Bombay, etc.

BIREME (Lat. bi + remus, two oar), a Roman ship of war with two banks of oars. It was inferior in magnitude and strength to the trireme.

BIREN, bē-rŏṅ, or **BIRON, Ernest John von** (DUKE OF COURLAND), Russian statesman (grandson of a groom of James, Duke of Courland, and the son of a Courland proprietor of the name of Bühren): b. 1687; d. 28 Dec. 1772. He studied at Königsberg, secured the favor of Anna Ivanovna, Duchess of Courland, and niece of Peter the Great of Russia; but he was unsuccessful in his attempt to obtain admission among the Courland nobility. When, in 1730, Anna ascended the Russian throne, Biren was loaded by her with honors and introduced at the Russian court. Here he assumed the name and arms of the dukes of Biron in France. Fierce and haughty by nature, he indulged his hatred against the rivals of his ambition. The princes Dolgorucky were his first victims. He caused 11,000 persons to be put to death and double that number to be exiled. It is said that the Empress often threw herself at his feet to induce him to lay aside his severity, but that neither her entreaties nor her tears were able to move him. The firmness of his character, however, introduced vigor and activity into all branches of the administration throughout the empire. In 1737 Anna forced the Courlanders to choose her favorite (who had in 1722 married a Courland lady) for their duke. After declaring Prince Ivan her successor, she appointed Biren regent. Anna died 28 Oct. 1740. The new regent acted with prudence and moderation. But a secret conspiracy was soon formed against him. Field-Marshal Münnich caused him to be arrested in his bed during the night of 19 Nov. 1740 and to be confined in the castle of Schlüsselburg. He was subjected to a trial; but the sentence of death was changed into that of imprisonment for life and his fortune was declared confiscated. Together with his family he was transported to Pelym, in Siberia, and thrown into a prison, of which Münnich himself had furnished the plan. In the following year Elizabeth, daughter of Peter the Great, being raised to the Russian throne by a new revolution, Biren was recalled 20 Dec. 1741, and Münnich was obliged to occupy his prison. At Kasan the sledges met; the travelers recognized each other and proceeded on their way without interchanging a word. Biren was detained at Jaroslav and only received his full liberty in 1762 from Peter III. When Catherine II ascended the throne the duchy of Courland was restored to Biren in 1763. He governed with wisdom and lenity, transferring the government to his eldest son, Peter. Consult Halem, ‘Lebensbeschreibung des russischen General-Feld-marschalls Münnich’ (Oldenburg 1803); Rambaud, ‘Russia’ (Vol. II); Rambaud and Lavisse, ‘Histoire générale’ (Paris 1893–1901); Ruehl, ‘Geschichte E. J. von Birons’ (1764); ‘Les antiquités russes’ (Moscow 1884); and ‘Lettres d’Anna Ivanovna’ (in *L’Archive Russe,* Vols. II and III, Moscow 1873–77).

BIRETTA, a cap worn by ecclesiastics, especially those of the Catholic Church, and by ritualistic clergymen of the Anglican and Episcopal churches. It is of considerable antiquity, though it has varied in shape and material at different times. It is at present a stiff-sided, square-shaped cap with sharp edges, a flattened top surmounted by ridges rising above it, having in the centre a sort of tuft or tassel. It is made of cloth or stuff, the color being black for priests, purple or violet for bishops and scarlet for cardinals. See VESTMENTS.

BIRGE, Edward Asahel, American naturalist: b. Troy, N. Y., 7 Sept. 1851. He was graduated at Williams College 1873; studied physiology and histology at Leipzig 1880–81; became instructor of natural history in the University of Wisconsin 1875; professor of zoology 1879–1911; dean of the College of Letters and Science in 1891; and acting president of the university 1900–03. In 1897 he became director of the Geological and Natural History Survey of Wisconsin and was a member of the State Forestry Commission 1905–15 and of the Conservation Commission 1908–15. He has written many articles and papers on zoology.

BIRGE, Henry Warner, American soldier: b. Hartford, Conn., 25 Aug. 1825; d. New York, 1 June 1888. At the outbreak of the Civil War he organized the 4th regiment Connecticut Volunteers and was commissioned its major. In November 1861 his uncle, Governor Buckingham of Connecticut, appointed him colonel of the 13th Connecticut Volunteers, which joined Butler's army at New Orleans. He took part in the siege of Vicksburg and the first Red River campaign; commanded a division in Grant's Virginia campaign; and was with Sheridan in the latter's most brilliant movements in the Shenandoah Valley. In November 1865 he resigned with the rank of brevet major-general.

BIRGER, bir′gėr, **OF BJÄLBO,** Swedish regent, sometimes called «the nameless king.»

He lived in the early part of the 13th century and was regent during the minority of his son, Waldemar, who succeeded Eric XI. He was the first to introduce Christianity into Finland where he extended the territories of Sweden. He was the founder of the city of Stockholm and established trade relations between the kingdom and Hamburg.

BIRINUS, Saint, bishop of Dorchester, Oxfordshire: d. 650. He was a Benedictine monk, sent by Pope Honorius to visit Britain, where he arrived in 634. Preaching to the heathen West Saxons, he succeeded in converting them to Christianity and baptized the King of Wessex, Cynegils. The see of Dorchester was founded and he became the first bishop. He built and consecrated a number of churches (according to Bede) and many peoples «were called to the Lord by his pious labors.» Birinus was buried at Dorchester in 650, but in 680 the remains were removed to Winchester. The Anglo-Saxon ‹Chronicle› refers to several princes baptized by Birinus and to his earnest endeavors as a missionary.

BIRKBECK, George, originator of mechanics' institutes: b. Settle, Yorkshire, 10 Jan. 1776; d. 1 Dec. 1841. He studied medicine in Edinburgh and took the degree of M.D. in 1799, among his friends and fellow students being Brougham and Jeffrey. He was appointed to the chair of natural and experimental philosophy in the Andersonian University at Glasgow, in 1799. The following year he began to give gratuitous lectures to mechanics, which were soon largely attended. This was the first attempt to establish mechanics' institutes, and to Dr. Birkbeck the honor of being their founder belongs. The Glasgow Mechanics' Institution, though not established till 1823, owed its origin to these lectures delivered by him. In 1804 he settled as a physician in London, and was soon engaged in an extensive practice; but the extension of scientific knowledge to working men was ever in his thoughts, and in 1824 he had the happiness of being elected president of the London Mechanics' Institution, for which that at Glasgow had led the way. Similar institutions soon arose and prospered in all the large towns of the kingdom. Dr. Birkbeck was also connected with the founding of University College, London, and advocated the repeal of the tax on newspapers. The London Mechanics' Institute still exists, but it is now known as the Birkbeck Literary and Scientific Institution.

BIRKENHEAD, England, a parliamentary, county and municipal borough of Cheshire, on the estuary of the Mersey, opposite Liverpool. Its growth has been rapid. It owes its prosperity to the same causes that have made Liverpool a great seaport, and may be regarded as a suburb of that city. Its docks have an area of 173 acres and a lineal quay space of over nine miles, with a complete system of railway communication for the shipment of goods and direct coaling of steamers. The system of drainage and sewerage is very complete. There is a theological college of the Church of England (Saint Aidan's); a free public library, schools of art, etc. The ruins of an ancient Benedictine priory founded in 1153 still exist in a good state of preservation. The ferry privileges were formerly vested in the monks of this priory. It has a large public park of 114 acres beautifully laid out. Its magnificent docks and dock warehouses, however, which belong to the splendid Liverpool system, form the distinguishing feature of Birkenhead. The Mersey tunnel, four and one-half miles long, including the approaches, 21 feet high and 26 feet wide, and which cost $6,100,000, now connects Liverpool with Birkenhead. Communication with Liverpool is also kept up by steam ferries, the property of the corporation, which yield a handsome revenue. The corporation also owns the gas, water and electric-lighting plants, and the tramway lines, which, introduced here by George Francis Train, were one of the earliest systems in Great Britain. The water supply, which is abundant and of excellent quality, is obtained within the borough by pumping from the red sandstone strata which underlie it. Birkenhead has gained a distinguished name for shipbuilding, the extensive yards of Laird Brothers (builders of the famous Confederate ship *Alabama*) being located here. There are machine and engineering works, and an extensive trade in coal, cattle, sheep and grain. Birkenhead has returned a member of Parliament since 1861. Pop. 130,794.

BIRKET-EL-KEROON («lake of the horn»), Egypt, is a lake in the Fayoom, about 30 miles long and 6 miles wide. It communicates with the Nile and had connection formerly with the artificial Lake Mœris, with which it has been confounded. See EGYPT — TOPOGRAPHY.

BIRKETT, Herbert Stanley, Canadian physician: b. Hamilton, Ontario, 17 July 1864. He graduated at McGill University in 1886; was senior house surgeon to the Montreal General Hospital 1886–87; assistant physician to the Montreal Dispensary 1887–89; laryngologist to Montreal Dispensary 1889–91, and to the General Hospital 1891–99; demonstrator of anatomy at McGill University 1890–1906; professor of laryngology and otology since 1895 and dean of the medical faculty at McGill University. He is the author of numerous medical works.

BIRKNER, Ferdinand, German anthropologist: b. Munich, 28 Dec. 1868. He was educated at the Wilhelms-Gymnasium and the university of his native city. He has made a special study of the natural sciences, particularly anthropology, and is now extraordinary professor of anthropology in the University of Munich and royal custodian of the state Anthropologico-Prehistoric Collection, Munich. He is also secretary of the Anthropological Society of Munich and member of the Imperial Leopold-Charles Academy of Naturalists and corresponding member of the Pontificia Academia Romana dei Nuovi Lincei. He has published ‹Beiträge zur Anthropologie der Hand› (Munich 1895); ‹Beiträge zur Rassenanatomie der Chinesen› (ib. 1904); ‹Der diluviale Mensch in Europa› (ib. 1910); ‹Rassen und Völker der Menschheit,› in collaboration with Wilhelm Schmidt (1911). He is a contributor to *Archiv für Anthropologie Korrespondenzblatt der Deutschen Anthropologischen Gesellschaft, Natur und Kultur,* etc.

BIRMINGHAM, Ala., «the Pittsburgh of the South,» the industrial head of the entire South between Atlanta and New Orleans, and the chief centre of the iron and coal industry south of Pennsylvania; county-seat of Jefferson County, in the northern centre, is situated midway between the Coosa and Black Warrior rivers, 608 to 1,000 feet above the sea, in a valley, near where the last Appalachian spurs sink to the coast plain, 96 miles north of Montgomery, the State capital, and 168 miles west of Atlanta. Nine railroad systems radiate from Birmingham to every section of the country; the Alabama Great Southern, Seaboard Air Line, Central of Georgia, Illinois Central, Atlanta, Birmingham and Atlantic, Southern, Frisco, Louisville and Nashville and Mobile and Ohio. Located in the heart of the greatest coal, iron and limestone district of the South, around it lie three huge coal fields, the Warrior, Cahaba and Coosa, aggregating over 8,610 square miles, with some 60 seams, more than half of them workable; the nearest deposits being only four miles from the city, and all of them having an estimated available supply in 1911 of 68,572,000,000 tons. Birmingham is built partly upon the slope of Red Mountain, named from its outcrop of hematite iron ore, which extends many miles in every direction from the city, in a vein from 6 to 26 feet thick with an indefinite depth. This district produced in 1915 about 95 per cent of the State's production of 17,884,745 tons of coal, 3,526,624 tons of coke and 2,025,378 tons of pig iron. In 1915 1,121,618 freight cars were hauled in and out of Birmingham, carrying 70 per cent. of the entire tonnage of Alabama, and also hauling more than 1,000,000 tons of limestone. This ideal equipment for the production of iron and steel at the lowest cost is building up a great city with such rapidity that no statistics can be other than temporary. After the census of 1904, Birmingham extended its corporate limits to six times the former area; that is, from 4,270 acres to 30,881 acres. Populous suburbs were added in which are manufacturing establishments.

Business Establishments, etc.— There are in Jefferson County more than 300 mining and manufacturing plants of various kinds, among which are 27 blast furnaces, 7,168 coke ovens, 60 coal mines, a large number of mines and stone quarries, two steel plants, three rolling mills, a wire rod and nail mill, a steel rail mill, besides other plants of various kinds. In 1912, 255 new companies were organized, with a capital of $6,068,300, and existing corporations increased their capital stock $4,213,900 and made extensions to their plants costing several millions. In 1909, according to the Federal census, the city of Birmingham alone had 248 manufacturing establishments of the factory system grade, which were operated on a capital of $23,718,147; employed 10,150 wage earners, paid for wages $4,392,476, for materials used in process $14,009,700, and for all expenses $21,549,129, and had products aggregating $24,128,214 in value, nearly one-sixth of the total for the State. These figures showed an increase in 10 years of 139 establishments, $19,404,000 in capital, $3,003,500 in wages, $10,000,000 in cost of materials and $15,530,000 in value of products. The Birmingham district contains over 50 blast furnaces and more than half of all the iron smelters in the State: and smelting 2,500 tons of iron daily, it became fourth in production of iron in the world in 1908. Ten years before, Birmingham was already furnishing six-sevenths of the total United States' export of pig iron, but since then none of the product has been exported on account of the increased home demand. The maximum production of iron ore, pig iron, coal and coke was made in 1910, when the output of iron ore was 4,801,275 long tons; pig iron, 1,969,770 long tons; coal, 16,111,462 short tons, and coke, 3,249,027 short tons; the entire output having a value of $59,614,012. The first steel plant in the South was started in 1897 at Birmingham, two open-hearth furnaces of 160 tons a day; now the Tennessee Coal, Iron and Railroad Company has in operation at Ensley, a suburb, 10 furnaces and a 44-inch blowing mill, capacity 1,000 tons a day. This is the largest basic open-hearth plant in the world except the Carnegie works at Homestead. There is a casting plant and rail mill in connection with it. The Alabama Steel and Shipbuilding Company began in 1899 with $1,000,000 capital, and the Alabama Steel and Wire Company with $2,000,000 capital. In recent years, owing to the superior quality of the basic over the Bessemer steel, the demand of the country has been for basic rather than Bessemer steel rails. This change resulted in a production of basic rails in 1911 nine times larger than that of 1905, and of Bessemer rails less than one-third as large. Besides the plants already mentioned, Birmingham has a steel casting plant, a bi-product plant, a wrought pipe plant, cast pipe and foundry plants, pipe fittings plant, soil pipe plants, clay pipe plant, cement factories, chemical works, fertilizer factories, corn mill, flour mill, ice factories, gas and gasoline engine works, iron and steel bridge works, boiler works, foundries and machine shops, stove foundry, railroad shops, sash factories, wagon factories, agricultural implement works, printing and bookbinding concerns, hollow ware plant, brick plants, planing mills and wood working plants, packing company, etc. Birmingham is the second largest yellow pine market in the South and is also a cotton market, the cotton receipts annually exceeding 125,000 bales. It has cotton factories, cotton seed oil mills and knitting factories. Besides the unparalleled cheapness of material, its transportation facilities have been greatly increased by the government improvements on the Warrior and Tombigbee rivers, by which coal and other products are transported to tide water at Mobile, thence to the Atlantic seaboard at greatly reduced cost. In 1913 Birmingham produced 17,884,745 tons of coal, 3,526,624 tons of coke, 2,025,378 tons of iron and 778,390 tons of steel. Its bank deposits amounted to $28,883,316, its bank clearings to $173,857,772.

Public Institutions, etc.— Birmingham is a handsome and solidly built city with wide avenues, handsome dwellings and imposing public buildings. It has a large government building, county court-house, new city hall, «sky-scraper» business houses, a fine public library, high schools and other educational buildings and numerous handsome churches. Among other notable buildings are the Jefferson Theatre, the Auditorium, Saint Vincent's Hospital, Hillman's Hospital, Union Station and the Hillman, Tutwiler and Molton hotels. There are 16 or more public parks, the most prominent of which are the Capitol, North Birmingham, East Lake and Lakeview. The city has an extensive waterworks system, with a reservoir on Shade's Mountain, 225 feet above the city, a Waring system of sewage and over 180 miles of street railroads, connecting not only with immediate suburbs, but with points many miles away.

The educational facilities are of the best. There are five high schools and 60 elementary schools besides colleges of high repute, including a dental college. Its charitable institutions include Saint Vincent's Hospital, Hillman Hospital, Mercy Home, Jefferson County Almshouse and the Boys' Industrial School at East Lake.

Government.— Birmingham is now governed by five commissioners, under whose administration much effective work has been accomplished with a great saving of expenditure. The fire department has been modernized by the installation of motor driven apparatus. The assessed valuation of the city's real estate in 1913 was $86,073,000, the tax rate $1; the same year 3,641 new buildings were erected at a cost of $6,429,737.

History.— Birmingham is entirely the creation of the last 30 years. The future of the district was foreseen as early as 1849, but the first attempt to realize it was about 1870 by a company which bought a made tract of land around Elyton, then the county-seat, now a suburb of Birmingham, which sought to make that the centre of the new development. It failed because prices were too high, and another company bought a tract to the east, where stood a single shanty on the spot where the Florence Hotel now stands, which they named Birmingham. The next year a small iron furnace was erected and this started up coal mining. Coal had hitherto lacked a market, but in 1874, 50,400 tons were mined. The demand of the Oxmoor furnace for coal led, in 1879, to the opening of the Pratt mines, and with this began the era of great growth. The population leaped in the next decade from 3,000 to 26,000, a growth unparalleled in United States history, except by Chicago. Retarded for some years by the collapse of the boom, it still had grown 46.7 per cent by 1900. The city is the business hub of a large group of cities and towns, built up by the same interests and but little removed from each other. A number of these have been incorporated under the name of Greater Birmingham. The largest of these surrounding towns is Bessemer, 11 miles away; others are Ensley, Pratt City, Elyton, Gate City, Irondale, Powderly and Smithfield. When Birmingham was settled, the county had 12,345 inhabitants; in 1910 it had 226,476, practically all the growth of the Birmingham district. The rapidity of the city's present growth is shown by the fact that in a single year (1913) 3,641 new buildings were erected at a cost of $6,429,737. Birmingham is becoming popular as a convention city. Its numerous auditoriums together with the modern hotels and apartment buildings enable the city to accommodate some of the largest gatherings in the country.

Population.— By the census of 1880, the first after Birmingham's settlement, the population was 3,086; in 1890, 26,178; in 1900, 38,415; in 1910, 132,685, many surrounding precincts having been annexed in 1903 and 1910; in (1920) 178,270.

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William Blanks Everett,
General Manager Chamber of Commerce.

BIRMINGHAM, England, a city and a municipal county and parliamentary borough and one of the greatest manufacturing cities of the world, situated on the river Rea, near its confluence with the Tame, an affluent in the northwest extremity of the county of Warwick, 112 miles northwest of London and nearly in the centre of England (north lat. 52° 28′ 45″, west long. 1° 54′). The lower part of the city, consisting chiefly of old houses, is crowded with workshops and warehouses, and inhabited principally by the working classes; but the upper part has some fine streets and buildings, and there are fine suburbs westward and southward of the city.

Public Buildings.— The town hall, built of Anglesey marble in 1832, is a rectangular building, modeled after the temple of Jupiter Stator at Rome. Its large hall is 145 feet long, 65 feet wide and 65 feet high, seating 2,250 persons, and contains a magnificent organ. In this hall a great musical festival is held once every three years, the proceeds of which go to the General Hospital. It was at the Birmingham Festival that Mendelssohn's oratorio, 'Elijah,' was first performed (1846), and Gounod's 'Redemption' and Elgar's 'Dream of Gerontius' are among other famous works first heard at this festival. Among other public buildings of note are the council-house, for the accommodation of the different corporation offices, with fine reception rooms and council chamber, erected 1874–78 (cost $1,000,000); the Victoria Law Courts, a fine edifice in terra cotta (Renaissance), (cost $580,000); University buildings, municipal technical school, municipal schools of art and design, Grammar School of King Edward VI, Bingley Hall (a large covered place holding 25,000 persons, wherein the late John Bright, W. E. Gladstone and Joseph Chamberlain have addressed vast audiences), postoffice, corporation baths, the stations of the L. & N. W., Midland and Great Western railways, cavalry barracks, public libraries, the Exchange buildings, art gallery (special features, paintings by David Cox and by the Pre-Raphaelite school of artists, and valuable collections illustrative of industrial arts), Birmingham and Midland Institute, Corn Exchange, Masonic hall, markets, etc.

Monuments.— The public statues include those of Queen Victoria, Prince Albert, James Watt, Joseph Priestley, Lord Nelson, Sir Robert Peel, John Bright, Joseph Sturge, Thomas Attwood, George Dawson, Dr. R. W. Dale, Sir Josiah Mason, etc.

Churches, Hospitals, etc.— The mother church of Birmingham is that of Saint Martin's,

BIRMINGHAM, ALA.

1 Highland Avenue — Residence Section

2 Part of Downtown Business Section

or the Old Church (built about 1250, rebuilt 1875), the parish registers of which date from the year 1544; this church contains several altar tombs of the Birmingham family. Saint Philip's (recently constituted the cathedral church) was the second parish church, built 1711, palladian style, restored 1868; both churches contain fine stained-glass windows designed by Sir E. Burne Jones, a native of Birmingham. Among the more noteworthy non-Anglican churches are the Roman Catholic cathedral of Saint Chad, a noble Gothic church designed by Pugin, richly adorned with stained-glass windows, and with fine 16th century pulpit and stalls; the oratory of Saint Philip Neri (founded by Cardinal Newman); the old Meeting House of Carr's Lane (Congregational), associated with the labors of John Angell James and R. W. Dale; the Wesleyan Central Mission Hall, erected 1903, surmounted by a lofty Renaissance tower, and seating over 2,000 persons (cost $300,000); the two Unitarian churches, «Old Meeting House» and «Church of the Messiah,» the successors of the old meeting houses destroyed in the memorable riots of 1791. Among the charitable institutions the most important are the General Hospital (founded 1766, rebuilt on new site 1894–97, cost over $1,000,000); the Queen's Hospital; Free Hospital for Sick Children; Women's Hospital; Ear and Throat Hospital; Orthopædic and Spinal Hospital; Homœopathic Hospital; Skin and Lock Hospital; Dental Hospital; Eye Hospital; Jaffray Hospital for Convalescent Patients, etc.

Educational Institutions.— The principal educational institutions are the Birmingham University, incorporated 1900, a growth of Mason University College, founded by Sir Josiah Mason in 1875 (and further endowed by public subscription with about $2,000,000), which has faculties of arts, science, medicine and commerce, while new buildings for the engineering, physics and science sections generally have been erected in the suburb of Edgbaston at a cost of about $2,000,000; Roman Catholic College at Oscott; Wesleyan Theological College at Handsworth; Saltley diocesan training college; Free Grammar School founded by Edward VI out of the endowments of the older Birmingham town guild, which has a central and seven branch schools; Blue Coat School; Protestant Dissenting Charity School (for maintaining and educating poor girls for domestic service); the municipal schools of art and design, and technical schools; industrial schools, and numerous public elementary schools, mostly erected by the now defunct school board, and maintained by the council under the Education Act, 1902.

Libraries.— There is a central free library, having 170,000 volumes in its reference section, a Shakespeare Memorial Library (11,500 volumes), and 11 lending libraries, containing over 110,000 volumes; the Birmingham Library, an old proprietary library (established 1779), which contains 80,000 volumes.

Parks, etc.— There are 10 public parks and several recreation grounds, and the city owns two natural beauty-spots somewhat remote from its boundaries, viz., Rednal Hill (Lickey) and Warley Abbey estate. In Aston Park (one of the oldest belonging to the city) is Aston Hall, a fine Jacobean residence built by Sir Thomas Holte in 1618, which was besieged in the civil war by the parliamentary forces, Decembc. 1643. Its chief features are the long gallery, one of the finest in England, and the great staircase, which was injured during the siege. The Hall is now a public museum.

Industries.— The prosperity of Birmingham is attributable to the excellence, variety and extent of its hardware and metal manufactures, as well as to its geographically central situation on the border of the great South Staffordshire coal and iron district, combined with the command of a wide and ready transit by canal and railway. There is an extensive system of tramways. At Soho, in the vicinity of the city, was the earliest and one of the largest steam-engine manufactories in the world, belonging to Boulton, partner of the celebrated James Watt, whose workshop is still preserved intact in the garret of his house in the suburb of Heathfield. The Soho works were founded in 1757 and came into the possession of Matthew Boulton in 1762. Not a vestige of the buildings now remains. About everything from pins and needles to military supplies are manufactured in Birmingham. The iron and steel industries are among the largest, the production for the period January–October 1916 being 156,920 long tons at the average price of $65.65 per ton. One of the most important manufactures is that of firearms. The number of gun-barrels tested in recent years has been between 500,000 and 600,000. The manufacture of swords is also one of the staple trades. Cast-iron articles of all kinds, and of the most beautiful patterns and workmanship, are manufactured at Birmingham to a great extent. In former years iron-founding was limited to large and heavy articles, but is now extended to the lightest and most graceful, in the finishing of which bronze is very generally employed. The manufacture of railway wagons and carriages has been very extensively developed. The quantity of solid gold and silver plate manufactured is large, and the consumption of silver in plating is very great. Electroplating was first practised in this town in 1840. After the outbreak of the Great War Belgian refugees were employed here in cutting valuable diamonds, an industry that bids fair to become permanent. Japanning, brass-founding, glass manufacturing and glass staining or painting are important trades. There are also large chemical works for vitriol, sal-ammoniac, cobalt and other substances. Steel pens, of which hundreds of millions are manufactured annually, pins, buttons, fancy seals, brooches, clasps and other trinkets are made in immense quantities. Bicycles, motor cars, tires and accessories are made in Birmingham in greater numbers than in any other town in England. It also has a large cotton trade and important lumber interests. In 1916 the declared exports from Birmingham to the United States amounted to $2,743,402.

Government, etc.— The charter of incorporation dates from 1838. By the Reform Act of 1832 Birmingham was constituted a borough, sending two members to Parliament. The act of 1867 gave it a third, while that of 1885 added four others and divided the borough into seven parliamentary districts. In 1889 it was raised by order in council to the rank of a city, and by the Local Government Act of that year, it also became a county borough. A further order in council (1896) conferred upon the chief magistrate of the city the title of lord mayor. In 1891 the boundaries of the borough were extended, and its area is now 13,478 acres, comprising the parishes of Birmingham and Edgbaston, and parts of others. The borough is divided into 18 wards, and has 18 aldermen and 54 councillors. Water is now brought from the Elan Valley, Wales, a distance of 80 miles, at a cost of about $30,000,000. The corporation of Birmingham has long been recognized as in the forefront of British municipalities, a reputation which it largely owes to the work done by the Right Hon. Joseph Chamberlain (three times mayor). The corporation purchased the gasworks and waterworks in 1875, and the Electric Company's rights in 1898. In 1876 an «Improvement Act» was obtained, by which at a cost of about $10,000,000 a large area of unsanitary property in the centre of the city was removed, and Corporation street was laid out on the site thereof. The corporation also owns the markets, slaughter-houses and street railways, and is the largest employer of labor in the borough, and a large landowner.

History, Populations, etc.— The city of Birmingham is supposed to have originated in a Saxon settlement formed in a clearing in the great central forest of England, the forest of Arden, near to the Icknield street, a Roman road of which an original portion is still visible in Sutton Park. It was the home of the Bermings — the young, or progeny of Berm, from whence the name is derived. It was a place of comparatively small importance at the Conquest, although it is mentioned in Domesday Book (1086) where it is called Bermingham, a name of which there were many corruptions, chiefly arising from the old pronunciation and from misspellings, wherefrom the popular local name «Brummagem» is derived. In the 14th century two guilds were founded, the more important of which (the Guild of the Holy Cross) exercised functions akin to those of a municipal character, until the dissolution of the monasteries and religious houses. There was also a priory or hospital of Saint Thomas, and several chantries attached to the parish church, but all these were sequestrated with the religious houses. Some of the revenues of the town guild were devoted by Edward VI to the foundation of the Free Grammar School. Birmingham was visited in 1532 by John Leland, who wrote of it in his ‹Itinerary› as having «many smiths in the town, that make knives and all manner of cutting tools loriners that make bits, and many naylors.» Camden, in 1576, found it «swarming with inhabitants and echoing with the noise of hammers and hammers.» In the civil war Birmingham suffered considerably at the hands of Prince Rupert and the royalists, who encountered the inhabitants in a fierce hand-to-hand fight in the streets, and burnt a great many houses, in 1643. The plague also ravaged the town in 1665. The old market town first began to outgrow its ancient boundaries in 1700, at which date the population was about 15,000. Birmingham began to assume importance as a manufacturing town about the middle of the 18th century. John Baskerville, by his fine printing, John Taylor by innumerable fancy articles, Boulton and Watt by the introduction of the steam engine, helped to make Birmingham «the toyshop of Europe,» as Burke described it. Steel was made there until 1797, and cotton spinning was begun as early as 1730. In the 19th century the introduction of steel pens and electro-plated goods gave Birmingham new fame as a manufacturing centre. It also attracted attention as the centre from whence spread the Reform agitation of 1830, which culminated in the Reform Bill of Earl Grey, which became law in 1832. Birmingham had also an unenviable reputation for rioting and disturbance at the end of the 18th century, and the Priestly Riot of July 1791 is among the memorable *émeutes* of that century.

The general healthfulness of Birmingham is probably due to the large quantity of open space which it possesses; to the general excellence of its drainage, greatly facilitated by the substratum of sand and gravel (belonging to the new red sandstone or Trias formation) on which it is built; to its pure water supply; and the circumstance that there is scarcely an underground dwelling or cellar (used as a dwelling) within its precincts In 1915 the birth-rate was 25.8 and the death-rate 14.8 per thousand. In 1801 the population was 75,670; in 1901 it was 523,179, and in 1911 525,833; but this does not take into account the densely populated boroughs and urban districts by which the city is closely surrounded. With the inclusion of these the urban population of the midland metropolis would amount to 868,430.

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R. K. Dent,
Chief Librarian Aston Manor, and author of ‹Old and New Birmingham,› etc.

BIRNAM, Scotland, a forested hill in eastern Perthshire, near Dunkeld, immortalized by Shakespeare in ‹Macbeth.› It was foretold to the ambitious thane, yet guiltless except in thought of bloody ambition, that, until Birnam wood should come to Dunsinane, his life and power could suffer no disaster. On the approach of Malcolm with the avenging army, the invaders, ignorant of the prophecy, cut down the boughs and bore them as leafy screens, by which to conceal their numbers. The report of «the moving forest» marching upon Dunsinane struck a fatal despair into the soul of Macbeth, the usurper.

BIRNEY, David Bell, American military officer (son of J. G. Birney, q.v.): b. Huntsville, Ala., 29 May 1825; d. Philadelphia, Pa., 18 Oct. 1864. He was graduated at Andover, later studied law in Cincinnati and in 1848 began practice in Philadelphia where he remained for several years. In April 1861, upon the outbreak of the Civil War, he entered the Union army as lieutenant-colonel of the 23d Pennsylvania Infantry; in the summer of 1861 was commissioned colonel; in February 1862 was raised to the rank of brigadier-general of volunteers; and was promoted major-general of volunteers 23 May 1863. He served throughout the Peninsula campaign (q.v.) and with particular distinction at the battles of Yorktown and Williamsburg. He subsequently distinguished himself at the second battle of Bull Run and in the battles of Fredericksburg and Chancellorsville. He was in command of the 3d Army Corps during a part of the battle of Gettysburg; from May to June 1864 was in command of a division under General Hancock; and from July 1864 commanded the 10th Corps of the Army of the James.

BIRNEY, James Gillespie, American politician: b. Danville, Ky., 4 Feb. 1792; d. Perth Amboy, N. J., 25 Nov. 1857. He studied law, and removed early to Alabama, where he prospered in his profession and held the office of district attorney. Having had his attention turned toward the question of property in slaves, in 1833 he interested himself in the organization of a branch of the Colonization Society for the State of Alabama. Soon afterward, returning to Kentucky, he organized one there also, of which he became president. But in 1834, his views rapidly advancing, he espoused the cause of immediate emancipation in a public letter, at the same time emancipating all his own slaves, about 20 in number. This letter, the ‹Letter on Colonization› (1834), was shortly afterward followed by ‹American Churches the Bulwarks of American Slavery› (1840); ‹Speeches in England› (1840); and ‹Examination of the Decision of the United States Supreme Court in the Case of Stroder et al. vs. Graham› (1850). Making arrangements to establish a newspaper to disseminate these views at Danville, where he resided, and where he held the situation of professor in the university, he found it impossible to have such a paper printed in Kentucky, and removed to Cincinnati, where he began to issue the *Philanthropist.* It had not been long published before it was found no less obnoxious to public sentiment in Ohio than it had been in Kentucky, and the press was thrown into the river. The editor, however, managed to revive the paper, and, in connection with Dr. Bailey, made it a powerful instrument in acting upon the opinion of the State. About the year 1836 he went to New York as secretary of the American Anti-Slavery Society, and for many years devoted his time and strength to the furtherance of the objects of that Society by letters and articles from the press and by public addresses wherever he could make an opportunity to be heard. His purpose was to build up a political party upon the single question of slavery, to act upon the government within the forms of the Constitution; and he succeeded in forming an organization in most of the Northern States, under the name of the Liberty Party. During his absence in England he was nominated in 1840 by that party for the presidency, but met with little success. He was again nominated in 1844, when he received more votes. It was charged upon his friends at the time that by withdrawing their votes from Mr. Clay, especially in the State of New York, they accomplished the election of Mr. Polk, thus aiming the death-blow at their own projects. Previous to this, in 1842, Mr. Birney had become a resident of Michigan, where not long afterward he was disabled, by a fall from his horse, from taking the active part in politics to which he had been accustomed. The latter part of his life was spent at Perth Amboy, N. J. Consult the biography by his son, William Birney, ‹James G. Birney and His Times› (New York 1890).

BIRNEY, William, American lawyer: b. Madison County, Ala., 28 May 1819; d. Washington, D. C., 14 Aug. 1907. He was educated in Paris; took part in the Revolution of 1848, and was appointed professor of English literature in the college at Bourges, France. In 1861 he entered the United States army as a private, and was promoted through all the grades to brevet major-general. He drilled the colored troops, and freed the inmates of all the slave prisons in Baltimore. In 1863–65 he commanded a division. In 1874 he moved to Washington, D. C., where he became attorney for the District of Columbia. His writings include ‹Life and Times of James G. Birney,› ‹Plea for Civil and Religious Liberty,› etc.

BIRON, bē-rŏn, **Baron de** (ARMAND DE GONTAUT, dé gŏṅ-tō), French soldier: b. 1524; d. 1592. He took a prominent part in the civil wars between the Huguenots and Catholics, and served at the battles of Dreux, Saint Denis and Moncontour. He was made marshal of France in 1577 by Henry III. He negotiated the peace of Saint Germain, and narrowly escaped the massacre of Saint Bartholomew. He recovered Guienne and Languedoc from the Protestants, served in the Netherlands against the Duke of Parma, and was one of the first to recognize Henry IV as King. He distinguished himself in various battles and was killed at the siege of Epernay.

BIRON, Duc de (CHARLES DE GONTAUT), French soldier, son of the preceding: b. about 1562; d. 31 July 1602. He served Henry IV in the field with much zeal and courage, was raised to the rank of admiral of France in 1592, and in 1598 was made a peer and duke. He thought himself, however, not sufficiently rewarded, and began to intrigue with the Spanish party against the King. In 1599 he concluded an agreement with the Duke of Savoy and the Count of Fuentes, by which he pledged himself to take up arms against his benefactor. Meanwhile, war being declared against the Duke of Savoy (1600), Biron saw himself reduced to the necessity of attacking him. He still continued his negotiations with the enemy, however, and at last they became known to the King, who interrogated the marshal as to his designs, with promises of pardon. Biron made a partial confession and continued his intrigues as before. Notwithstanding this, Henry sent him in 1601, after the conclusion of peace with Savoy, as envoy to Queen Elizabeth of England. In the meantime the Count of Fuentes discovered the whole plot. He was tried before Parliament, and was beheaded.

BIRON, Ernest John. See BIREN.

BIRRELL, Augustine, English essayist and statesman: b. Wavertree, near Liverpool, 19 Jan. 1850. He was graduated at Cambridge and was called to the bar. In 1903 he became a Bencher of the Inner Temple; from 1896–99 was Quain professor of law in University College, London; from 1889–1900 represented Fifeshire W. in Parliament, and since 1906 North Bristol. He is author of charming critical and biographical essays on literary subjects, collected in the two series of ‘Obiter Dicta’ (1884; 2d series, 1887) and ‘Res Judicatæ’ (1892); ‘Men, Women and Books’ (1895). In 1887 he published a ‘Life of Charlotte Brontë; in 1897 edited Boswell's ‘Life of Johnson’; in 1898 published ‘Life of Sir Frank Lockwood’; ‘Copyright in Books’ (1899); ‘Collected Essays’ (1900); ‘Miscellanies’ (1901); ‘William Hazlitt’ (1902); ‘Andrew Marvell’; ‘In the Name of the Bodleian’ (1905). In 1905 he became president of the Board of Education in the Liberal Cabinet and from 1907–16 was Chief Secretary for Ireland. His occupancy of the latter post was brought to a sudden termination. Coincidentally with the capture of Sir Roger Casement (q.v.), who had landed from a German submarine on the coast of Kerry on 21 April 1916, a rebellion broke out on 24 April in Dublin, organized by the Sinn-Feiners, the ultra-Radical, physical-force section of the Irish Nationalists, and simultaneously movements of the same kind took place in other centres, mainly in the west and southwest. On the suppression of these outbreaks Mr. Birrell at once resigned (3 May), the lead the rebels were enabled to make being generally attributed to the supineness of the Irish Office.

BIRT, Henry Norbert, English Benedictine monk and author: b. Valparaiso, Chile, 1861. He was educated at London University College School; entered the Benedictine order in 1880; taught in Downside School 1884–92, and was ordained in 1889. He was assistant at Coventry 1892–95, and chaplain at Heckfield and Ealing. He was acting chaplain to the forces during the South African War, receiving medal with four clasps. In the European War he again served as chaplain after 1915. Since 1904 he has been official secretary to the president of the English Benedictines. He has done much literary research work, visited Germany as one of the Catholic representatives of British Christian Churches in 1909, and is the author of an abridgment of Lingard's ‘History of England’; ‘History of Downside School’; ‘Elizabethan Settlement of Religion’; ‘The Line of Cleavage under Elizabeth’; ‘Benedictine Pioneers in Australia’ (2 vols.); ‘Obit Book of the English Benedictines.’ He is a contributor to the *Tablet*, the *Downside Review* and the ‘Catholic Encyclopædia.’

BIRTH, or **LABOR**, in physiology, is the act by which a female of the class Mammalia brings one of her own species into the world. When the fœtus has remained its due time in the womb, and is in a condition to carry on a separate existence, it is extruded from its place of confinement, in order to live the life which belongs to its species independently of the mother. The womb having reached its maximum of growth with the increasing size of the fœtus, its peculiar irritability excites in it the power of contraction; it thereby narrows the space within and pushes out the mature fœtus. The period of gestation is very different in different animals, but in each particular species it is fixed with much precision. In the womb the corporeal frame of man commences existence as an embryo; after further development, appears as a fœtus; then as an immature, and finally a mature, child. With its growth and increasing size the membranes which envelop it enlarge, the womb also expanding to give room for it. At the end of the 39th or the beginning of the 40th week the child has reached its perfect state and is capable of living separate from the mother; hence follows in course its separation from her, that is, the birth.

Contractions of the womb gradually come on, which are called, from the painful sensations accompanying them, labor-pains. These are of two kinds: first, the preliminary pangs, which begin the labor, do not last long, are not violent and produce the feeling of a disagreeable straining or pressure. When the pregnant female is involved in these she is often unable to move from her place till the pang is over, after which she is often free from pain for some hours. Then follow the true labor-pains; these always last longer, return sooner and are more violent. The contractions of the womb take place in the same order as the enlargement had previously done, the upper part of it first contracting, while the mouth of the womb enlarges and grows thin, and the vagina becomes loose and distensible. By this means the fœtus, as the space within the womb is gradually narrowed, descends with a turning motion toward the opening; the fluid contained in the membranes enveloping the fœtus, as the part making the greatest resistance, is forced out, and forms a bladder, which contributes much to the gradual enlargement of the opening of the womb. It is therefore injurious to delivery if hasty or ignorant midwives break the membranes too soon. By repeated and violent throes the membranes at length burst and discharge their contents, and some time after the head of the child appears. As the skull-bones have not yet acquired their perfect form and substance, but are attached at the crown of the head only by a strong membrane, and may be brought nearer together, the head, by the pressure which it undergoes, may be somewhat diminished in size and squeezed into a more oblong form, so as to pass through the opening of the matrix and the pelvis in which it is contained, and, finally, through the external parts of generation; and when this is done, the rest of the body soon follows.

The act of birth or delivery is accordingly, in general, not an unnatural, dangerous and diseased state of the system, as many timid women imagine. It is a natural process of development, which is no more a disease than the cutting of the teeth or the coming on of puberty, although, like them, it may give rise to important changes in the body and to various diseases. It is true that the process of childbirth requires a violent exertion of nature, but this is facilitated by many preparatives and helps adapted to the purpose. If the birth succeeds in the way described, it is called a natural birth. For this it is requisite that the pelvis should be properly formed and the opening should permit a free passage to the perfect fœtus; that the growth and size of the fœtus should be proportioned to the pelvis, especially that the head should have the size designed by nature, proportioned to the diameter of the pelvis; also, that there should be a proper situation of the womb, in regard to the axis of the pelvis, and a proper position of the fœtus, namely, the head down, the back of the head in front and toward the opening of the womb, so as to appear first at birth; and, finally, that the external parts of generation should be in a natural state.

An easy birth takes place without any excessive strainings and in due season. A difficult birth proceeds naturally, but is joined with great efforts and pangs, and occupies a long time — over six or eight hours. The cause of it is sometimes the stiffness of the fibres of the mother, her advanced years, the disproportionate size of the child's head and various other causes. Nature, however, finishes even these births; and women in labor ought not to be immediately dejected and impatient on account of these difficulties. An unnatural (or properly, an irregular) birth is one in which one or more of the above-mentioned requisites to a natural birth are wanting. An artificial birth is that which is accomplished by the help of art, with instruments or the hands of the attendant. Premature birth is one which happens some weeks before the usual time, namely, after the seventh and before the end of the ninth month. Though nature has assigned the period of 40 weeks for the full maturing of the fœtus, it sometimes attains, some weeks before this period has elapsed, such a growth that it may be preserved alive, in some cases, after its separation from the mother. That it has not reached its mature state is determined by various indications. Such a child, for instance, does not cry like full-grown infants, but only utters a faint sound, sleeps constantly, and must be kept constantly warm, otherwise its hands and feet immediately become chilled. Besides this, in a premature child, more or less, according as it is more or less premature, the skin over the whole body is red, often indeed blue, covered with a fine, long, woolly hair, especially on the sides of the face, and on the back; the fontanel of the head is large, the skull-bones easily moved; the face looks old and wrinkled; the eyes are generally closed; the nails on the fingers and toes short, tender and soft, hardly a line in length; the weight of such a child is under six, often under five pounds. The birth is called untimely when the fœtus is separated from the womb before the seventh month. Such children can rarely be kept alive; there are instances, however, of five months' children living. Some writers have contended that a seven months' child is more likely to live than one born a month later.

Late birth is a birth after the usual period of 40 weeks. As this reckoning of the time from pregnancy to birth is founded for the most part solely on the evidence of the mother, there is much room for mistake or deception. The question is one of much interest in medical jurisprudence, as the inquiry often arises whether a child born more than 40 weeks after the death of the reputed father is to be considered legitimate or not. The importance of the question and the uncertainty of the proof have occasioned a great variety of opinions among medical writers. Most of them doubt the truth of the mother's assertions about such a delayed birth and give as their reason that nature confines herself to the fixed period of pregnancy; that grief, sickness, etc., cannot hinder the growth of the fœtus, etc. Others maintain, on the contrary, that nature binds herself to no fixed rules; that various causes may delay the growth of the child, etc.

Abortion and miscarriage take place when a fœtus is brought forth so immature that it cannot live. They happen from the beginning of pregnancy to the seventh month, but most frequently in the third month. The occasions, especially in those of a susceptible or sanguine temperament, are violent shocks of body or mind by blows, falling, dancing, cramp, passion, etc.

BIRTH RATE. See VITAL STATISTICS.

BIRTHMARK. See NÆVUS.

BIRTHRIGHT, any right or privilege to which a person is entitled by birth, such as an estate descendible by law to an heir, or civil liberty under a free constitution. See PRIMOGENITURE.

BIRTHROOT. See TRILLIUM.

BIRTHS, Registration of. The original object of birth registration, which was performed by the clergy in England as early as 1538, was to prevent disputes regarding inheritance, but it was not until 1837 that systematic records were kept in England by the Registrar-General's Office becoming compulsory in 1876. On the continent birth registration became compulsory in most countries during the 19th century. In most of the United States birth registry is also compulsory, but it is only in Pennsylvania, Michigan and most of the New England States that the laws are fully enforced. In 1912 the Census Bureau prepared a model bill for the registration of births, which is being urged upon the individual States by the various organizations interested in vital statistics, among these, for obvious reasons, being the societies seeking to limit the employment of children and to control infant mortality. See VITAL STATISTICS.

BIRTHWORT. See ARISTOLOCHIA.

BIRU, the name of a warlike chief of South America, who flourished in the 16th century. During an exploring expedition of Gaspar de Morales in 1515 the Spaniards encountered a chief called Biru, by whom they were repulsed. His territory extended on both sides of the river Biru or Piru. All the country south of the Gulf of Panama was soon characterized as the Biru country. In 1526 this name was given to the empire of the Incas, now known as Peru.

BIRUNI, bē-roo'nĭ, **Abu Raihan Muhammed ibn Ahmed**, Arabian scholar and writer: b. Khwarizm 973; d. Ghazni, Afghanistan, 1048. He visited India, where he spent a long period teaching the Greek sciences and observing the life and customs of the people. His latter years were spent at Ghazni, Afghanistan. Some of his more important works have been translated into English by C. E. Sachaw, among these being ‹Chronology of Ancient Nations› (London 1879); ‹An Account of the Religion, Philosophy, Literature, Geography, Chronology, Astronomy, Customs, Laws and Astrology of India about 1030 A.D.› (London 1910).

BISBEE, William Henry, American general: b. Rhode Island, 28 Jan. 1840. At the outbreak of the Civil War he enlisted as a private and served until its conclusion. On the mustering out of the volunteers he was retained in the regular establishment, after which he served against the Indians in the West, quelling many of the Indian disturbances. During the Spanish-American War he served in Cuba, participating in the battles of El Caney and San Juan. In 1899 he was transferred to the Philippines, where he had command of all the American forces north of Manila for some time. In 1902 he was retired with the rank of brigadier-general.

BISBEE, Arizona, town of Cochise County, the terminus of a branch line of the El Paso and Southwestern Railroad, which connects with the Southern Pacific Railroad at Benson. Bisbee lies in a cañon of the Mule Pass Mountain, about 30 miles south of Tombstone, the county capital, and has gold, silver and lead mining interests and is a busy copper mining and smelting centre, the daily output in the district reaching about 7,000 tons. It contains two hospitals and a public library. Pop. 9,019.

BISCAY (Spanish VIZCAYA, vēth-cä-yä), Spain, a province, forming one of the three Basque provinces, the other two being Alava and Guipúzcoa. It lies near the northeast corner of Spain, between the Bay of Biscay and the provinces of Santander, Burgos, Alava and Guipúzcoa. The area is 836 square miles; the population was estimated at 368,024 in 1914. The surface is generally mountainous; the principal river is the Nervion or Ibaizabal. In point of soil and natural productions Biscay is one of the least favored provinces of Spain; but the industry of the inhabitants has converted naturally barren tracts into fruitful fields and verdant pastures. The chief crops are maize and barley. Many fine fruits, especially nectarines, are raised; walnuts and chestnuts everywhere abound and form a considerable export to England and Germany. The cattle are of a small and inferior breed; and the rearing of sheep for wool is rendered difficult by the brushwood which covers a great part of the mountain districts and tears and destroys the fleece. Fish abound along the coast and give occupation to a great number of fishing-boats. The most important mineral is iron, which is found of excellent quality throughout the province and is extensively worked. Lead, copper and zinc also occur. The inhabitants of Biscay, who are called Basques, are brave, active and industrious. The capital of Biscay is Bilbao (pop. 93,536).

BISCAY, Bay of, Roman «Sinus Aquitanicus,» «Sinus Cantabricus,» «Cantaber Oceanus» or «Gallicus Oceanus,» and French «Golfe de Gascogne,» called the Cantabrian Sea; that portion of the Atlantic Ocean which sweeps in along the northern shores of the Spanish Peninsula in an almost straight line from Cape Ortegal to Saint Jean de Luz, at the western foot of the Pyrenees, and thence curves north along the western shores of France to the island of Ushant. Its extreme width is about 400 miles and its length about the same. The depth of water varies from 20 to 200 fathoms, being greatest along the northern shores of Spain. The whole of the southern coast is bold and rocky and great parts of the French shores are low and sandy. The bay receives numerous unimportant streams from the mountains of Spain and, through the rivers Loire, Charente, Gironde and Adour, the waters of half the surface of France. Its chief ports are Santander, Bilbao and San Sebastian, in Spain; and Bayonne, Bordeaux, Rochefort, La Rochelle and Nantes, in France. Navigation of the bay is proverbially trying to inexperienced voyagers and is frequently rendered dangerous by the prevalence of strong winds, especially westerly ones. Rennel Current sweeps in from the ocean round the northern coast of Spain. Consult «Transactions» (Linnean Society of London, series 2 ‹Zoology,› London 1904–11).

BISCEGLIE, bē-shāl-yạ, Italy, a seaport town in the province of Bari, 13 miles east-southeast of Barletta, on a rock on the western shore of the Adriatic, surrounded by walls and in general badly built. It has a cathedral, a dilapidated castle, a seminary, a hospital and the ruins of a hospital for pilgrims founded by the Crusaders. The port admits vessels of small burden only. The town being almost destitute of water, rain is collected in large cisterns cut in the solid rock. The neighborhood produces good wine. Important fairs are held here twice a year. Pop. 34,425.

BISCHOF, bĭsh'ōf, **Karl Gustav Christoph,** German geologist and chemist: b. Nuremberg, 18 Jan. 1792; d. Bonn, 30 Nov. 1870. He studied in Erlangen; became professor of chemistry and technology there in 1819 and professor of chemistry and mineralogy at Bonn in 1822. He devoted himself especially to geological research and advanced some entirely new opinions in regard to the formation of mountain ranges, on which he wrote three works. He also made a series of important experiments on gases in coal mines and safety lamps. His greatest work, ‹Text-book of Chemical and Physical Geology› (3d ed., 1863–66), is an important contribution to the development of that phase of geological research.

BISCHOFF, Joseph Eduard Konrad, German novelist: b. Niedergailbach, 9 Aug. 1828; d. 1910. He was fitted for the priesthood, studying at the Catholic Seminary at Munich and was ordained a priest, but later gave his whole attention to literary work and wrote a number of novels in which he attacks the Protestant Reformation and the modern movement in literature and science. Among his works are ‹Historical Novels concerning Frederick II and his Time›; ‹Wegenfried›; ‹Gustavus Adolphus›; ‹The Free Thinkers›; ‹The Social Democrats and their Fathers›; ‹Otto the Great›; and ‹The New God.›

BISCHOFF, Theodor Ludwig Wilhelm, German physiologist: b. Hanover, 28 Oct. 1807; d. Munich, 5 Dec. 1882. He was educated at Bonn; was lecturer in the university there in 1833; and professor at Heidelberg in 1836, in 1844 he was at Giessen and from 1855–78 at Munich. His chief work was a series of books on the history of the development of man and some of the higher animals and his ‹Evidence of the Periodic Ripening and Detachment of the Ova, independently of Generation in Man and the Mammals.› He also established the presence of carbonic acid and oxygen in the blood and studied the difference between man and the anthropoid apes,

BISCUIT, a thin cake, baked until crisp and dry. In this shape it is known in the United States as a cracker; the name biscuit being applied to a soft cake made from dough raised with yeast. Plain biscuits are more nutritious than an equal weight of bread, but owing to their hardness and dryness, they should be more thoroughly masticated to insure their easy digestion. When exposed to moisture, biscuits are apt to lose their brittleness and become moldy, hence it is necessary to keep them in a dry atmosphere. Digestive biscuits consist almost entirely of bran. Charcoal biscuits contain about 10 per cent of powdered vegetable charcoal. Meat biscuits, which are very nutritious, contain either extract of meat, or lean meat which has been dried and ground to a fine powder.

In pottery, articles molded and baked in an oven, preparatory to the glazing and burning. In the biscuit form, pottery is porous, but the glaze sinks into the pores and fuses in the kiln, forming a vitreous coating to the ware.

BISHARRIN, bē-shạ-rēn′, a group of tribes of northeast Africa, forming the northern division of the Beja, said to be the Kushites of the Bible. They live between the Red Sea and the Nile and between Egypt and Abyssinia; they are nomadic in habit and nominally Mohammedans. They are of Caucasian race and speak a well-developed Hamitic language. The grammar has been compiled by Olmkvist (Upsala 1881–85) and Reinisch (Vienna 1893). Consult Munzinger, ‘Ostafrikanische Studien’ (Schaffhausen 1864).

BISHOP, Sir Henry Rowley, English musical composer: b. London, 18 Nov. 1786; d. 30 April 1855. He was trained to his profession under Signor Bianchi, composer to the London Opera House. In 1809 his first important opera, the ‘Circassian Bride,’ was produced at Drury Lane with great success; but the following evening the theatre, with the score of Bishop's opera, was consumed by fire. Numerous operas and other musical pieces of his composition now followed and from this period to 1826 upward of 70 works were produced by him. Among others may be mentioned the music of ‘Guy Mannering’; ‘The Slave’; ‘The Miller and His Men’; ‘Maid Marian’; ‘The Virgin of the Sun,’ and the adaptations of ‘The Barber of Seville’ and the ‘Marriage of Figaro.’ From 1810 to 1824 he acted as musical composer and director to Covent Garden Theatre. He also arranged several volumes of the ‘National Melodies’ and completed the arrangement of the music for Moore's ‘Irish Melodies,’ commenced by Sir John Stevenson. In 1826 Bishop produced an opera called ‘Aladdin,’ which was not successful. He was elected Reid professor of music in Edinburgh University in 1841, was knighted in 1842 and in 1848 became professor of music in the University of Oxford. Some of his work is the most popular of all music among English-speaking people, particularly his setting of John Howard Payne's «Home Sweet Home» and «When the Bloom is on the Rye.» His manuscript scores may be found in the Royal College of Music and the Liverpool Free Library.

BISHOP, Isabella (Bird), English author and traveler: b. Boroughbridge Hall, Yorkshire, 15 Oct. 1832; d. 7 Oct. 1904. She began to travel at the age of 22 and made her first trip abroad in 1855, when she visited Prince Edward Island and the United States and afterward circumnavigated the globe three times. In her later years she spent much time in Japan and the Far East. In 1892 she was elected the first lady fellow of the Royal Geographical Society. She was married in 1881 to Dr. John Bishop, who died five years later. Her publications include ‘The English Woman in America’ (1856); ‘Six Months in the Sandwich Islands’ (1873); ‘The Hawaiian Archipelago’ (1875); ‘A Lady's Life in the Rocky Mountains’ (1874); ‘Unbeaten Tracks in Japan’ (1880); ‘Journeys in Persia and Kurdistan’ (1892); ‘Among the Tibetans’ (1894); ‘Korea and Her Neighbors’ (1898); ‘The Yangtze Valley and Beyond’ (1899); ‘Pictures from China’ (1900). Her ‘Life,’ by A. M. Stoddart, was published in London 1907.

BISHOP, Joseph Bucklin, American author and government official: b. Seekonk, Mass. (now East Providence, R. I.), 5 Sept. 1847. A graduate of Brown University, after several years' editorial experience on the *Tribune*, *Evening Post* and *Globe*, New York city, he was appointed secretary of the Isthmian Canal Commission 1 Sept. 1905. He wrote ‘The Panama Gateway’ (1913); and with Robert E. Peary, ‘Uncle Sam's Panama Canal and World History’ (1913). His previous works were ‘Cheap Money Experiments’ (1892); ‘Our Political Drama’ (1904); ‘Issues of a New Epoch’ (1904).

BISHOP, Louis Faugères, American physician: b. New Brunswick, N. J., 14 March 1864. He was graduated at Rutgers College in 1885 and at the New York College of Physicians and Surgeons in 1889. He was resident physician of Saint Luke's Hospital, New York, in 1889–92 and secretary of the New York Academy of Medicine and chairman of its Section of Medicine in 1900. His publications include ‘Arteriosclerosis’ (1914); ‘Heart Disease, Blood Pressure and the Nauheim Treatment’ (1914).

BISHOP, Seth Scott, American physician: b. Fond du Lac, Wis., 7 Feb. 1852. In his boyhood he learned the printer's trade and edited and published a paper called *The Pen* while attending Pooler Institute, a private school, setting all the type and printing it himself. Before graduating from Pooler Institute, he entered upon the study of medicine. After his course at this school, he was a student at Beloit College for three years, took two courses at the University of the City of New York, medical department, and completed his undergraduate course at Chicago Medical College, now the Northwestern University Medical School, from which he was graduated M.D. in 1876. Among other institutions which have conferred degrees upon him are the Chicago Law School and the Chicago School of Science. He did post-graduate work in Chicago and in Berlin, Germany. For a short time he practised his profession in his native town and in Rochester, Minn., after which, in 1879, he removed to Chicago where he has practised continuously since. For more than 15 years he was engaged in general practice, but afterward made a specialty of diseases of the nose, throat and ear. In order to meet the necessities of his special practice he has devised over 50 instruments and surgical appliances, discovered camphor-menthol, which is in universal use now in various countries, and invented new methods in his chosen field of work; has taught in several medical colleges of Chicago and is now a professor of diseases of the nose, throat and ear in the Loyola University Medical School.

Dr. Bishop has written for a large number of medical journals and has been either editor or associate editor of the Illinois *Medical Bulletin,* the *Medical Examiner,* the New York *Medical Times* and others. He was the head surgeon of the ear, nose and throat department of the Illinois Charitable Eye and Ear Infirmary and served on its staff for more than 15 years. He has written extensively in his special field. His publications include 'Diseases of the Ear, Nose and Throat and Their Accessory Cavities' (4th ed., 1908) and 'The Ear and Its Diseases' (1906).

BISHOP, William Henry, American novelist: b. Hartford, Conn., 7 Jan. 1847. He was graduated at Yale in 1867. He studied architecture, then engaged for a while in journalism, being one of the editors and proprietors of the *Daily Commercial-Times* at Milwaukee, Wis. From 1892 to 1902 he was instructor in French and Spanish at the Sheffield Scientific School of Yale, resigning to live in Europe. He was appointed United States consul to Genoa, Italy, 1903, and was transferred to Palermo 1905, which post he resigned 1910. Since then he has lived by turns abroad and in this country, his main preference being for quiet rural life. He was decorated by the King of Italy for services in the great earthquake at Messina 1908. His published works are 'Detmold' (1879); 'The House of a Merchant Prince' (1882); 'Choy Susan and Other Stories' (1884); 'Old Mexico and Her Lost Provinces' (1884); 'Fish and Men in the Maine Islands' (1885); 'The Golden Justice' (1887); 'A House Hunter in Europe' (1893); 'The Brown Stone Boy and Other Queer People,' reissued as 'Queer People' (1902); 'Sergeant Von' (1889); 'The Yellow Snake,' reissued as 'Tons of Treasure' (1902); 'A Pound of Cure' (1894); 'Writing to Rosina' (1894); 'The Faïence Violin,' translation from the French of Champfleury (1893).

BISHOP (Sax. *biscop,* from Gr. *episcopos,* a superintendent), in the Greek, Latin and Anglican churches, the title given to those who are of the highest order of the priesthood, to the successors of the 12 apostles, in distinction from the priests who are the successors of the 72 disciples; in the Methodist Episcopal and Moravian churches and in the Protestant churches of Sweden, Norway and Denmark, the title given to the highest officers in the ministry, who are not, however, regarded as a distinct order; in Germany the office is hardly more than titular and is conferred upon princes. as well as ecclesiastics. The name was borrowed by the first Christians from the languages of Greece and Rome, in which it designated a civil magistrate. Thus, Cicero was at one time *episcopus oræ campaniæ.* In the New Testament the words bishop and presbyter, or priest, are sometimes interchanged, as in Acts xx, 17, 28; and Saint John, in his last two epistles, adopts the title of priest. Yet, as maintained by Roman Catholic writers, it does not follow because the names priest and bishop were then applied indistinctly, that there existed no distinction between the episcopate and the priesthood. «There might have been confusion in the names,» says Saint Thomas, «but not in the character.» The identity of the original signification of the words «presbyter» and «bishop» was acknowledged by the Christian fathers Saint Jerome and Saint Augustine in the 5th century, and even by Pope Urban II at the end of the 11th century, and it is not denied by many Episcopalians even at the present day. By the Council of Trent, however, the doctrine which placed presbyters and bishops originally on a footing of perfect equality in the early Church was declared a heresy, thus denying to the bishops of the Church the priority of rank which they claimed.

Those who adhere to the Episcopalian form of Church government and at the same time admit the original identity of presbyters and bishops, differ from the Presbyterians in their theory of the origin of the episcopal authority. The Episcopalians maintain that even before the words had a separate meaning attached to them the distinction between bishops and subordinate pastors existed in fact and was a regular ecclesiastical institution, those who held a peculiar authority over others being appointed originally by the apostles. The Presbyterians, on the other hand, believe that the authority that was undoubtedly conceded to certain of the «bishops» or «presbyters» when they met to consider the affairs of the Church, was not due to any formal appointment, but merely to the mutual agreement of the assembled presbyters and that this distinction was no more than a mark of respect paid to some member who was venerable by his age or distinguished by his piety. But, whichever of these two theories may be correct, there is no doubt of the fact that at a comparatively early period in the history of the Church a position of authority was acquired by the pastors of the Christian communities belonging to certain places, and that these came to be distinguished from the others by the name of bishops. The growth of this authority was favored by the doctrine which we find stated in the beginning of the 2d century with regard to the priestly dignity being a peculiarly divine institution. The more this doctrine was affirmed the higher grew the claims of the bishops. Ignatius of Antioch, who died about 115, had already declared every bishop to be a representative of Christ, in which we have the statement of the doctrine of the apostolic succession, that is to say, the doctrine of the transmission of the ministerial authority in uninterrupted succession from Christ to the apostles and through these from one bishop to another. By the foundation of new churches in the larger towns which were affiliated with the original churches and by the dependence of the presbyters in the country districts upon those having urban charges, the authority of the bishops came to be gradually extended over greater or lesser dioceses; and at the same time the bishops began to reserve to themselves peculiar privileges. As the early Church advanced and increased in growth, the offices and jurisdiction of the bishops developed correspondingly and by the 2d century their duties are clearly marked off from the subordinate clergy.

While this, then, was the position of the bishops in relation to the presbyters, they at first considered themselves as standing on a footing of equality in relation to each other. But as certain of the presbyters in their assemblies had acquired a priority of rank over the others, it gradually came about in the same way that the bishops of the chief cities (Jerusalem, Antioch, Corinth, Alexandria, Constantinople, Rome) obtained a similar precedence among the bishops and received the title of metropolitan bishops; and very early in the history of Christianity we find the Bishop of Rome claiming to be the head of the Church as the true successor of Peter, whom Christ Himself had pronounced to be the rock on which he would build his Church. Roman Catholic writers found this supremacy of Peter upon the evidence of Scriptures, upon the *a priori* argument of the necessity of one supreme head both in the matter of government and the preservation of the integrity of doctrine and upon the testimony of early ecclesiastical writers, who witness to the tradition of the universal supremacy of the Roman see.

After the transfer of the capital of the Roman empire to Constantinople, this city rapidly rose to ecclesiastical importance and became a metropolitan see. Its bishops made claim to be the first see in the Christian world after Rome on account of the imperial dignity of the city, but this assumption was stoutly resisted by the apostolic sees of the East, whom Rome always sustained against Constantinople's claim. After the Greek schism, Constantinople assumed the primacy of the Greek Church.

The practice of solemnly investing bishops with their offices dates from the 7th century. Already in the 5th century the Popes had begun to send to the newly elected metropolitan bishops (now called archbishops) the pallium, a kind of official mantle worn by archbishops, as a token of their sanction of the choice. Two centuries later it became the custom to consecrate bishops by investing them with the ring and crosier, the former as a token of marriage with the Church, the latter as a symbol of the pastoral office. Since this investiture was what gave validity to the election of the bishops, it became the source of long continued contests between the Popes and the temporal sovereigns in the Middle Ages. The influential position which the bishops occupied in the state caused the temporal rulers to be desirous of keeping the right of investiture in their own hands, while the Popes with equal determination claimed the right for themselves. The contest was most bitter between the Popes and the emperors of the Romans, as they were called. It began in the 11th century, but was not settled till 1122, when it was agreed in the concordat of Worms between Pope Calixtus II and the Emperor Henry V that the election of bishops should take place according to the laws of the Church, under the direction of the Emperor, and that the spiritual investiture (with ring and crosier) should remain in the hands of the Pope, while the bishops were to be invested with the temporal rights of their office by the Emperor. This is still the fundamental law of the Roman Catholic Church with regard to investiture. The election to a bishopric is for the most part in the hands of the dean and chapter of the cathedral of the diocese; but in some cases it is a right of the territorial sovereign. In any case papal confirmation is requisite before the appointment is complete. Roman Catholic bishops in England are appointed exclusively by the Pope.

When the system of the ecclesiastical rule was matured, the almost absolute authority exercised by bishops over the clergy of their dioceses; their intervention in the secular concerns of the governments, to which they soon rendered themselves necessary by their superior information and their elevated rank; the administration of the Church revenues; and their extensive ecclesiastical as well as criminal jurisdiction, drew them into the vortex of secular affairs, sometimes at spiritual expense. Still it continued to be the bishop's duty to teach and preach in his own diocese, to watch over purity of doctrine, to see that the people were provided with the sacraments, to visit the churches in his diocese, etc. The most distinctive functions of their spiritual office remained as they still are, the ordination of the clergy, the consecration of other bishops, the confirmation of youth, the consecration of churches, etc. In the Middle Ages they attached to themselves subordinate or assistant bishops called suffragans or coadjutors, who often had entrusted to them the performance of those functions which more especially concerned the Church. The episcopal office being such as we have described it, the nobility, and even the sons of princes and kings, strove to obtain a dignity which was as honorable as it was profitable, and was not deemed incompatible with festivities and luxurious enjoyments. The splendid establishments which they were able to maintain from the large revenues derived chiefly from rich donations to their churches by pious devotees, gave, to the bishops of Germany particularly, a high degree of dignity. They became princes of the empire, and their influence on public affairs was highly important.

The Reformation lessened the number of bishops, and though in some of the Protestant countries of the north of Europe the higher clergy have retained the title of bishop, yet they have lost the greater part of their former revenues and privileges, though in neither of these particulars have those of England any reason to complain. The Anglican Church has left to its bishops more authority than the rest. and this is one reason why it bears the name of Episcopal. To them belong ordination, confirmation, the consecration of churches, the licensing of curates, and institution to benefices. They receive their appointment from the Crown. In Prussia, though the majority of the population are Protestants, the Roman Catholic bishops receive an annual allowance from the state.

Some bishops in the Roman Catholic Church are nominally in charge of dioceses in countries which do not acknowledge the Christian faith. The dioceses of such bishops are said to lie *in partibus infidelium* (in parts belonging to unbelievers), and they are chiefly those that were wrested from the Christian Church by the Mohammedans.

The appointment of bishops was one of the grievances of the American colonists; few things more exasperated them than the scheme of appointing and sending out a bishop from England. It is said that there was a project of making Dean Swift bishop of the American colonies. In 1771, at the instance of the clergy of New York and New Jersey, the plan was again urged. The clergy of Virginia generally assented, but throughout America the dissenters and the Episcopal laity opposed. After the Revolution the case was altered. The first Episcopal bishop, Samuel Seabury, of Connecticut, was consecrated by Scotch non-juring bishops in 1784. The Methodists began to use the term bishop in 1787. The first Roman Catholic bishop, John Carroll, of Baltimore, was consecrated in 1790. See ARCHBISHOP; APOSTOLIC SUCCESSION.

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BISHOP-AUCKLAND, England, market town, in the county and nine miles southwest from the city of Durham, situated on an eminence at the confluence of the Gaunless with the Wear and has much improved in recent times. Near it is Auckland Palace, the episcopal residence, which covers about five acres of a park of 800 acres; its site was selected during the reign of Edward I (1272–1307). Among its buildings are a free grammar school (founded 1605), Saint Anne Chapel, Edgar Memorial Hall, Lightfoot Church Institute and the Temperance Hall. Iron founding and coal mining are the chief industries. Pop. 13,834.

BISHOP'S BOOK, a handbook of instruction and doctrine compiled in 1537 by a committee of bishops and ministers of the Anglican Church. It is to be found in 'Formularies of the Faith Put Forth by Authority During the Reign of Henry VIII.' Consult Hardwick, 'Reformation' (London 1856).

BISHOPS' SCHOOLS. At the beginning of the history of modern schools, the bishops were the chief educators and directors of educators, and their schools were the chief seats of education throughout western Europe. It is difficult to ascertain at what date the public schools of grammar and of rhetoric were superseded by the episcopal schools. In the 6th century, however, there is record of the identification of the episcopal office with that of the schoolmaster. This was not effected without opposition. But the necessity of teaching the gospel to converts brought in the obvious need of knowledge of Latin grammar, since it was considered sacrilegious to translate the sacred words into the heathen tongues. Augustine doubtless set up a school soon after his arrival in England. In Bede's 'Ecclesiastical History' we have a record of a grammar school at Canterbury. From this school the movement spread to France. In England in 635, Paulinus, first bishop of York, introduced a song school, similar to the one founded by Pope Gregory at Rome. Theodore and Tobias, bishop of Rochester, were well known teachers of grammar and rhetoric. Archbishop Egbert and his successor, Ethelbert, are mentioned by Alcuin in 780 as learned teachers of the seven liberal arts. From the end of the 8th century, the bishop himself ceased to teach in the secular cathedrals in most cases, and the duties of instruction and its supervision devolved upon the schoolmaster or chancellor of the church and his assistants. The monastic cathedrals retained the double function of the bishop. Throughout the 13th and 14th centuries we find references to the bishop's supervision of schools. The Reformation caused the schools to be made part of the new cathedral foundations, and at the same time brought the bishops into direct connection with all of the schools. Henry VIII, Queen Mary and Queen Elizabeth appealed to the bishops for aid in supervising the religious tenets of schoolmasters. The canons of the Church and the Orders of Privy Council on successive occasions in 1559, 1580 and 1603 forbade any schoolmaster to teach without the license of the bishop. This included even the elementary schools. After the commonwealth, the bishop's jurisdiction was restricted to grammar or classical schools. It was not until the Endowed Schools Act of 1869 that the bishop ceased to have the right to interfere with secondary schools. The schools were finally freed from all denominational restriction by the act of 1902, which transferred all supervisory power to the board of education.

BISHOPS SUFFRAGAN, a class of bishops in England appointed by the Crown to take the places of the early bishops *in partibus*, who were assistants to the active bishops of English sees, and who held their warrant at the pleasure of the bishops to whom they were assigned. They were distinguished from suffragan bishops in the Church of England, as every regular bishop was a suffragan of his superior or metropolitan.

BISKARA, bĕs'kạ-rä, or **BISKRA**, Algeria, a town situated at the southern base of the last spurs of the Aures Mountains, about 120 miles south-southwest of Constantine. The railway from Philippeville, on the Mediterranean, terminates here. It is situated in a fertile oasis three miles long, containing 150,000 date palms and numerous other fruit trees, and is the southernmost point of tourist travel in Algeria. It is an important military post, and there are sulphur springs in the neighborhood. The climate is one of the driest on the globe. Pop. of commune (1911) 10,606.

BISMARCK, Friedrich Wilhelm, (COUNT VON), German general: b. Windheim, Westphalia, 28 July 1783; d. 18 July 1860. In 1796 he entered the army of Hanover as an ensign, and in 1804 was attached to the Hanoverian legion in the English army. As the result of a duel he was forced to leave the English service. He entered that of the King of Würtemberg, in 1807, and was soon after appointed captain of cavalry. During the campaign in Russia, he served under the command of Ney, and distinguished himself at the Beresina. He was made a prisoner at Leipzig, but returned to Würtemberg in 1813. In 1815 he received the title of count; in 1819 he was appointed brigadier-general. In 1828 Count Bismarck introduced his system of cavalry tactics into the Danish army, and was soon after appointed commander-in-chief of the cavalry of Würtemberg. He published several military treatises, and also a work upon Russia.

BISMARCK, N. D., capital city of North Dakota, county-seat of Burleigh county, on the Missouri River, on the main transcontinental line of the Northern Pacific; division point on the Minneapolis, Saint Paul and S. Ste. Marie Railway; terminal for the Chicago Milwaukee & Saint Paul Railway, 194 miles west of Fargo, 12 hours from Minneapolis and Saint Paul, 24 hours from Chicago. Notable institutions are the State capital buildings, costing $1,000,000; Fort Abraham Lincoln, modern military post, costing $1,000,000, last command of Custer; United States Indian School; $150,000 Federal building, housing department of justice; district offices of department of animal husbandry; United States land office; local and district postal service heads; Burleigh county court-house; municipal auditorium erected by people at cost of $75,000, finest theatre between Minneapolis and Helena, Mont.; Bismarck and Saint Alexius hospitals; two largest sanatoriums in State, with more than 200 private guest rooms; seven-story hotel McKenzie, largest between Twin Cities and coast; four-story Grand Pacific hotel, covering quarter-block; State armory of national guard; Carnegie library costing, with site, $40,000; State library and historical museum; proposed site of large German Evangelical and Methodist Episcopal colleges. Bismarck is base of Missouri River navigation for distance of 1,500 miles and is home of a modern fleet of a dozen packet steamers. The Missouri River is spanned at this point by the only bridge over that stream in North Dakota, costing $1,500,000; counties of Morton and Burleigh are now bonding for third of million for construction of a wagon bridge. City has unlimited supply of pure, soft water, pumped from Missouri river and clarified; several miles of handsome, boulevard «White Way,» has 9 miles of paving under way; adequate sewer and storm drainage systems; gas and electricity for cooking and lighting, with electric cooking rate equivalent to dollar gas; street railway service; taxi-service; co-operative merchants' delivery. Assessed valuation of $2,500,000; city tax rate of 18.4 mills, lowest of any incorporated town in North Dakota. Industries include immense flour mills, elevators, stone and brick and pottery works; flax fibre mill; stock-food manufactories; largest greenhouses and nurseries in the State; oldest seedhouse in North Dakota; large packing plants. Is publishing centre for *Jim Jam Jems*, the *Northern Farmer, Public Opinion* and other periodicals of large general circulation; has three daily and weekly newspapers and number of monthly technical and secular publications. Trading centre for area 200 miles square; jobbing centre for district extending west into Montana; has 50 large wholesale and jobbing houses; distributes more automobiles and more farm implements than any other city but one in North Dakota. Three national banks with resources of $4,500,000; substantial building and loan association; home office of the Provident Insurance Company of North Dakota. In 1883 it was made the capital of Dakota Territory and in 1889 became the capital of North Dakota. Bismarck adopted the commission form of government in 1913. The North Dakota Industrial Exposition is held in Bismarck in October of each year. Pop. (1910) 5,443; (1920) 7,122.

G. N. KENISTON,
Secretary of the Bismarck Commercial Club.

BISMARCK ARCHIPELAGO, a group of islands formerly a German colony, formed in 1885, under agreement with the British government, by the consolidation of the New Britain Archipelago with adjacent islands. The principal islands of the group lie off the northwestern coast of New Guinea. The largest of them are Neupommern (formerly New Britain), and Neumecklenburg (formerly New Ireland). The group includes the Admiralty Isles, the French Islands, the Duke of York Islands, New Hanover and several others. The combined area of the group is about 18,000 square miles, and they have a population of about 200,000, mostly Papuans. The Bismarck Archipelago was captured by the Australian fleet on 12 Sept. 1914.

BISMARCK-SCHÖNHAUSEN, Herbert Nikolaus von, PRINCE, hĕr'bèrt nĭk'ō-lows bēs'märk-shėn'how-sĕn, German statesman: b. Berlin, 28 Dec. 1849; d. Friedrichsruhe, Prussia, 18 Sept. 1904; son of Otto Eduard Leopold, Prince von Bismarck-Schönhausen. He served as councillor to the London embassy; 1882–84; was under-Secretary of State in 1885, and negotiated the Anglo-German treaty of that year; and Secretary of State 1886–90. In 1889, the Emperor conferred on him the first class of the Order of the Red Eagle. When his father resigned in 1890, Herbert withdrew from the diplomatic service and remained upon his estate for several years. In 1893 and 1898 he was a member of the Conservative party in the Reichstag. His speeches are published under the title, ‹Politische Reden› (1899).

BISMARCK-SCHÖNHAUSEN, Otto Eduard Leopold von, PRINCE, of a noble family of the «Mark» (Brandenburg): b. Schönhausen, 1 April 1815; d. 30 July 1898. He studied at Göttingen, Berlin and Greifswald; entered the army and became lieutenant in the Landwehr. After a brief interval devoted to his estates and to the office of inspector of dikes, he became in 1846 a member of the provincial Diet of Saxony. And later he entered the Diet of Prussia, when he began to attract attention as an ultra Royalist. He opposed the scheme of a German empire as proposed by the Frankfort Parliament of 1849. His diplomatic career began in 1851, when he was appointed Prussian member of the resuscitated German Diet at Frankfort. In the Diet, he gave open expression to the long-felt discontent with the predominance of Austria, and demanded equal rights for Prussia. He remained at Frankfort till 1859, when he beheld in the approach of the Italian War an opportunity of freeing Prussia and Germany from the dominance of Austria. In the spring of 1862 King William, on the urgent advice of the Prince of Hohenzollern, transferred Bismarck as Ambassador to Paris, in order to give him an insight into the politics of the Tuileries. During his short stay at Paris Bismarck visited London, and had interviews with the leading politicians of the time, including Lord Palmerston and Disraeli. In the autumn Bismarck was recalled, to take the portfolio of the Ministry of Foreign Affairs, and the presidency of the Cabinet. Not being able to pass the organization bill and the budget, he closed the chambers (October 1862), announcing to the deputies that the King's government would be obliged to do without their sanction. When the «conflict era,» as it was called, approached a crisis, the death of the King of Denmark reopened the Schleswig-Holstein question, and excited a fever of national German feeling, which Bismarck was adroit enough to work so as to aggrandize Prussia by the acquisition of the Elbe duchies. Having disposed of the Danish trouble, Bismarck carried out a similar policy toward Austria which resulted in the defeat of Austria in the war of 1866.

The action of France in regard to the candidature of Prince Leopold of Hohenzollern for the throne of Spain gave Bismarck the opportunity of carrying into action the intensified feeling of unity among Germans. During the war of 1870–71, Bismarck was the spokesman of Germany; he it was that in February 1871 dictated the terms of peace to France. Having been made a count in 1866, he was now created a prince and chancellor of the German empire. Following the Peace of Frankfort (10 May 1871), the sole aim of Bismarck's policy, domestic and foreign, was to consolidate the young empire of his own creation. Thus, conceiving the unity of the nation and the authority of its government to be endangered by the Catholic Church and its doctrine of papal infallibility, he embarked on that long and bitter struggle with the Vatican, called the Kulturkampf, in the course of which the Imperial and Prussian parliaments passed a series of most stringent measures (Falk or May laws) against the Catholic hierarchy. But Bismarck had underrated the resisting power of the Church, and motives of political expediency gradually led him to modify or repeal the most oppressive of the anti-papal edicts, leaving the Catholics virtual masters of the field. Otherwise, his domestic policy was marked, among other things, by a reformed coinage, a codification of law, a nationalization of the Prussian railways (as a preliminary step to imperial state lines), fiscal reform in the direction of making the empire self-supporting (that is, independent of matricular contributions from its component states), repeated increase of the army and the regular voting of its estimates for seven years at a time (military septennate), the introduction of a protective tariff (1879), and the attempt to combat social democracy.

In 1884 Bismarck inaugurated the career of Germany as a colonizing power, a new departure which brought him into sharp but temporary conflict with the England of Gladstone. For the rest, his foreign policy mainly aimed at isolating France and rendering her incapable of forming anti-German alliances. On the other hand, he gradually combined the central powers of Europe into a peace league, aiming at counteracting the aggressiveness of Russia and France, separately or combined, on the Danube or the Rhine. The nucleus of this peace league was formed in 1879 by the Austro-German Treaty of Alliance (published in February 1888) which Italy formally joined in 1886, and which entitles Bismarck to be called the «peacemaker» and the «peacekeeper» of Europe, a character he first publicly acquired when, as «honest broker» between Austria and Russia, he presided over the Berlin Congress in 1878. The phrase, «man of blood and iron,» is based on the Iron Chancellor's own use of the words in a speech in 1862, a much misrepresented remark, as Bismarck afterward explained in his ‹Autobiography.›

Bismarck's life was often threatened, and twice actually attempted — once at Berlin in 1866, just before the Bohemian campaign, by Ferdinand Cohen (or Blind), a crazy youth who aimed at making himself the instrument of popular dissatisfaction with Bismarck, as the champion of absolutism and the fancied apostle of a fratricidal war; and again in 1874 at Kissingen, by a Roman Catholic tinsmith named Kullmann, who was a product of Ultramontane fury engendered by the May laws.

Emperor William died 9 March 1888. The short reign of Emperor Frederick followed and then William II ascended the throne. Resultant friction led to Bismarck's resignation on 18 March 1890. Many explanations have been given — that Bismarck objected to the labor rescripts, that he opposed the abolition of the laws against socialists, that he would not tolerate the Emperor's direct consultation with the other ministers or the parliamentary leaders. After the war with Denmark, King William had made Bismarck a count. After the conquest of France, Emperor William had named him prince. Emperor William II gave him the title of Duke of Lauenburg. When Bismarck's 81st birthday was celebrated in 1896, a reconciliation took place between the prince and his sovereign, and the Emperor visited Bismarck at Friedrichsruhe, where the statesman died two years later.

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BISMILLAH, Arabic, «In the Name of God,» a contraction of bi = in, ism = name, Allahi = of God. Every sureh or verse of the Koran begins with «Bismillâhi er-Rahmani er-Rahîm»=«In the Name of the All Compassionate God.»

BISMUTH, bĭz'mŭth, a metallic element, first accurately described by Pott in 1739. It was known before that time, but had been previously confounded with antimony and zinc, which it resembles to some extent. Bismuth occurs in nature in the metallic form, always in small quantities, and generally associated with copper, lead, cobalt, nickel, arsenic, silver, tin or rarely iron. It is found in various form — massive, granular, reticulated and arborescent. Several ores of it also are known, from which the metal may be easily obtained by roasting and smelting. The principal supply in Europe comes from Saxony, but considerable quantities are obtained from Austria, Norway, England, Spain and New South Wales. The largest known deposits are those of Bolivia where it is found as the hydrated oxide. In Mexico it is found as carbonate. Native bismuth is found in California but in very small quantities. Small amounts have been reported from Utah. The total consumption of the metal probably does not greatly exceed 50 tons per annum and the demand for it is so variable that the price has ranged all the way from 50 cents to $5 a pound. Bismuth is a grayish-white metal with a peculiar reddish tone, as compared with other white metals, and is highly crystalline, and so brittle that it can be readily pulverized. It melts at 510° F., and boils in the vicinity of 2300° F. Its specific gravity is about 9.82 at 54° F., that of the melted metal, just above the point of fusion, being 10.06. Its specific heat is about 0.030 at ordinary temperatures, and 0.036 just above the melting point. Its coefficient of expansion is about 0.000736 per degree Fahrenheit, its conductivity for heat is about one-fiftieth of that of silver and its electrical resistance at 32° F. is 1.15 times that of mercury at the same temperature. Bismuth is readily recognized by the spectroscope, as it shows a large number of characteristic lines. Its chemical symbol is Bi, and its atomic weight is 208.5 in the scale where O = 16. It has tensile strength of 6,400 pounds per square inch. According to some authorities, the specific gravity of metallic bismuth is diminished by pressure; but Spring has shown that this is not the case. He subjected a sample whose specific gravity was 9,804 to a pressure of 20,000 atmospheres, and found that the specific gravity rose to 9.856, while a second compression increased it still further, to 9.863. Bismuth expands upon solidifying, but Tribe has shown that this expansion does not take place until immediately after the congelation of the metal. Bismuth is the most diamagnetic substance known, a sphere of it being sensibly repelled by a magnet. It has marked thermo-electric properties also, on account of which it is much used in connection with antimony in laboratories in the construction of delicate thermopiles. In the arts, metallic bismuth is used chiefly in the preparation of alloys. By adding a small amount of it to lead, that metal may be hardened and toughened. An alloy consisting of three parts of lead and two of bismuth has 10 times the hardness and 20 times the tenacity of pure lead. The alloys of bismuth with both tin and lead are extremely fusible, and take fine impressions of casts and molds, owing to their property of expanding at the moment of solidifying. An alloy of one part of bismuth, two parts of tin, and one part of lead, is used by pewter workers as a soft solder, and by soap-makers for molds. An alloy containing five parts of bismuth, two of tin and three of lead melts at 199° F., and is somewhat used for stereotyping, and for the manufacture of metallic writing pencils. Thorpe gives the following proportions for the better known fusible metals, into which bismuth enters:

Newton's: Bismuth, 50; lead, 31.25; tin, 18.75. Melts at 202° F.

Rose's: Bismuth, 50; lead, 28.10; tin, 24.10. Melts at 203° F.

D'Arcet's: Bismuth, 50; lead, 25; tin, 25. Melts at 201° F. (If 250 parts of mercury are also added, the resulting alloy, or amalgam, melts at 113° F.)

Wood's: Bismuth, 50; lead, 25; tin, 12.50; cadmium, 12.50. Melts at 149° F.

Lipowitz's: Bismuth, 50; lead, 26.90; tin, 12.78; cadmium, 10.40. Melts at 149° F.

Guthrie's «eutectic» alloy: Bismuth, 50; lead, 20.55; tin, 21.10; cadmium, 14.03. Melting point not definitely stated, but said to be «very low.» See Fusible Metals.

The action of heat upon some of the foregoing alloys is remarkable. Thus, Lipowitz's alloy, which solidifies at 149°, contracts very rapidly at first, as it cools from this point. As the cooling goes on, the contraction becomes slower and slower, until the temperature falls to 101.3° F. From this point the alloy expands as it cools, until the temperature falls to about 77° F., after which it again contracts, so that at 32° a bar of the alloy has the same length as at 115° F. Alloys of bismuth have been used for making fusible plugs for steam boilers, but it is found that they are altered in some unknown way by prolonged exposure to heat, so that they cannot be relied upon, after any great length of time, to melt at the proper temperature. Some of the alloys of bismuth are also used in tempering steel.

In its compounds, bismuth has an odd valency — usually three, but sometimes five. Metallic bismuth does not oxidize readily in dry air at ordinary temperatures, but it burns with a blue flame when strongly heated in presence of air, passing into the trioxide, Bi_2O_3. If the trioxide is dissolved in a solution of caustic potash, and nitric acid is subsequently added, bismuth peroxide (or pentoxide, Bi_2O_5, is precipitated. The trioxide is pale yellow, and the pentoxide is brownish-red. The trioxide exists in nature as «bismuth ochre.» It is used for staining glass and porcelain. Both unite with acids to form salts. Bismuth trichloride, $BiCl_3$, is formed when the metal is heated in chlorine gas; it is a white, crystalline, deliquescent substance, which is decomposed by water with the formation of hydrochloric acid and bismuth oxychloride $BiOCl$. Bismuth trisulphide, Bi_2S_3, is thrown down as a black, insoluble precipitate, when a stream of sulphuretted hydrogen gas is passed through an acid solution of a salt of bismuth. The trisulphide also occurs native as «bismuth glance,» or Bismuthinite (q.v.). Bismuth dissolves readily in nitric acid, with the formation of the nitrate, $Bi(NO_3)_2 + 5H_2O$. A peculiarity of the soluble bismuth salts, as a class, is that their solutions are rendered milky by the addition of water in considerable excess, owing to the formation of insoluble basic compounds. The nitrate, for example, becomes transformed by this process into a series of so-called sub-nitrates.

In medicine, bismuth is used in the form of some one of this metal's insoluble salts, the soluble salts of bismuth being actively poisonous. The poisoning closely resembles that caused by lead (q.v). The insoluble salts used most frequently are bismuth subnitrate, subcarbonate, salicylate and subgallate. These are for the most part employed as gastric sedatives, as gastro-intestinal anti-fermentatives, and locally as bland astringent dressings.

Practically the entire commercial supply of bismuth in the United States market is obtained as a by-product in smelting lead, copper, gold and silver ores. In the lead-silver mines at Leadville, Colo., occur occasional pockets of ore that are relatively rich in bismuth. These ores are smelted separately to secure a lead rich in bismuth, which is afterward treated by the electrolytic process to recover the bismuth. A very large quantity of bismuth is vaporized and escapes from the chimneys of the great smelters. An examination at the Anaconda smelter proved that not less than 800 pounds of metal was lost daily in this way. The demand, however, is limited, and the production is kept by the manufacturers at a point where the price which can be obtained will be large enough to make the recovery profitable. The latest figures on the production of bismuth in the United States given by the Geological Survey are those for 1914 — a total of 220,000 pounds, valued at $426,000. Since then the government has ordered the figures concealed, as they might reveal facts relating to private business. The imports have fallen off in value from $330,000 in 1913 to $180,000 in 1915.

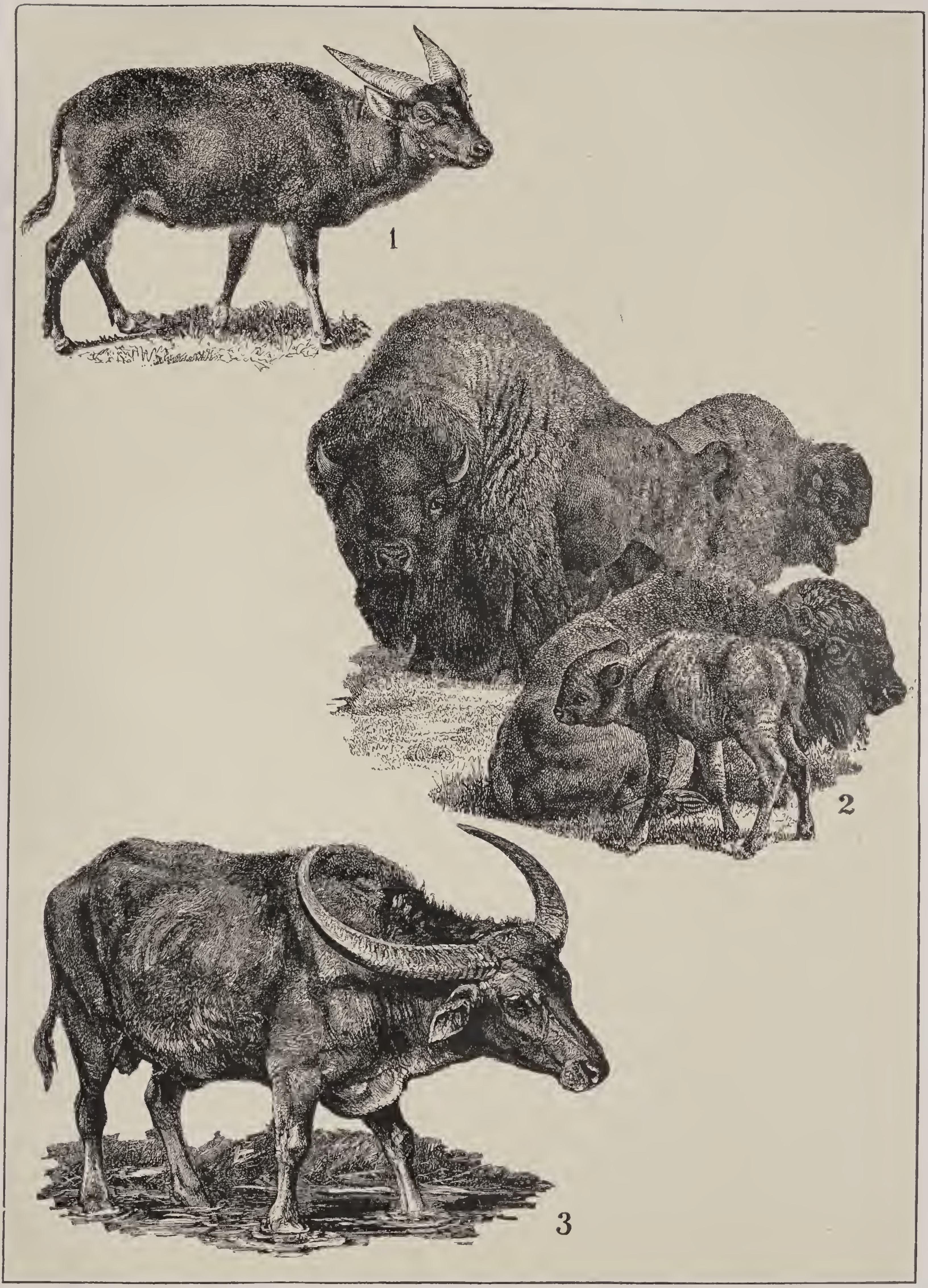
BISMUTHINITE, a native sulphide of bismuth, having the formula Bi_2S_3. It commonly occurs massive, but is also found in needle-like crystals belonging to the orthorhombic system. It is opaque, and leaden in color, often with a superficial yellowish or iridescent coating. Its hardness is 2, and its specific gravity usually about 6.5. In the United States it occurs in Connecticut, California, North Carolina and Utah. It is also found in Mexico and Canada, and in Sweden, France, England, Saxony, Bohemia, New South Wales, Hungary, Cornwall and Bolivia. Where it can be had in quantity, it is mined as an ore of bismuth.

BISMYA, in Mesopotamia (ancient Babylonia), between the Tigris and Euphrates, about 32° N. and 45° 40′ E. Within a space of less than a square mile there are a number of ruined mounds up to 40 feet in height. In 1904 Dr. Edgar J. Banks, deputed by the University of Chicago, conducted excavations here, which led to the discovery that the site was that of the ancient city of Adab (Ud-Nun), referred to in the code of Hammurabi, dating back to nearly 3,000 B.C. The city appears to have been abandoned ages ago, for some of the ruins unearthed belong to the kings of Ur. Dr. Banks found a number of inscribed tablets of stone and bronze, walls, towers, houses and tombs, besides a perfect white marble statue inscribed «E-mach, King Da Udu, King of Ud Nun.» The statue now reposes in the Museum of Antiquities on Seraglio Point in Constantinople. A refuse heap close to a temple contained many pieces of marble, onyx, porphyry and alabaster vases, inlaid with precious stones and ivory.

BISON, a form of wild cattle regarded by some naturalists as constituting a genus *Bison*, separated from the larger group *Bos*, which is represented by the American «buffalo,» the European aurochs, and some extinct species. Bison differ from other cattle, in external appearance, mainly by their massive and shaggy forms. Their heads are exceedingly broad, and the horns curve outwardly from each side of the forehead, and are short, round and thick. A mop of long and shaggy hair covers the forehead, nearly hiding the little eyes, and forms a great beard upon the throat and chin, especially of the bulls. In order to support this massive head, which is usually carried low, great spines rise from the vertebræ of the back over the shoulders, giving attachment to the huge muscles necessary to support the skull. This makes the neck very thick, and the fore-quarters much higher than the haunches, which droop away from the arched contour of the back, over the withers. The massive appearance of the fore-quarters is increased by the long growth of hair on the neck, shoulders and fore-legs, which is especially coarse and shaggy in bulls, and is of protection to them in their furious assaults upon one another in the rutting season. This hair consists mainly of a short, crisp, wool-like growth, different from that of other cattle, and capable of being woven. Internally, the bison are peculiar in having 14 ribs instead of 13; in the breadth and convexity of the frontal bones of the skull, in having six instead of four nasal bones; and in the comparative slenderness of the bones of the limbs. The bison are inhabitants of the northern hemisphere, and, in the era preceding the present, were represented by two or three species of probably circum-polar range. The race is represented in the Old World by the aurochs, now preserved only in small, protected herds in Russia (see AUROCHS); and in America, by the buffalo (*Bison americanus*), now nearly extinct.

The American bison or buffalo is somewhat smaller than the aurochs, and has shorter and thicker horns, and a shorter tail, but its hump and fore-quarters are higher, and more shaggy. The females are much inferior to the males in bulk, weighing only about 1,200 pounds, whereas an old bull in good condition will weigh 2,000 pounds. The American animal differs in one very important respect from the European species, due to the difference in their habitats. The auroch was a native of a region covered with forests, where large herds could not find open pasturage of any considerable extent, and

BOVIDÆ



1 Celebes Wild Ox or Anoa 2 North American Bison or Buffalo 3 Indian Domestic Buffalo

consequently moved about only in small bands, whereas the American animal had open to it the immense, grassy prairies and plains of the interior of this continent, and was able, and in effect, forced to join into vast herds, so that it acquired gregarious habits. When North America was explored by white men, the bison was first encountered in the valleys of the Alleghanies, and scattered throughout the prairies of the Mississippi Valley, north of the Tennessee River. Its principal home, however, was upon the grassy plains, between the Missouri River and the Rocky Mountains, where the herds sometimes contained hundreds of thousands of individuals, and grazed all the way from southern Texas to the shores of Great Slave Lake. They wandered through the valleys of the Rocky Mountains, to the plains of New Mexico, Utah and Idaho, but seemed never to have crossed the Sierra Nevada. Those east of the Mississippi River were probably killed off before the beginning of the 19th century, and by 1850 none remained east of the dry plains. The building of the Union Pacific and Kansas Pacific railroads, where the early trains were sometimes stopped by herds crossing the tracks, soon led to the disappearance of the animals from the central plains; and by 1875 they were divided into two distinct groups, a northern and a southern. These were rapidly slaughtered by parties of men who followed the animals at all seasons, and killed them for their hides, which, as «buffalo robes» became more and more valuable, until by 1890 the Texan herd had been utterly exterminated, and of the northern herd, none remained except such as had been gathered by the government for preservation in Yellowstone Park, and a few hundred that still survive in the remote forests beyond the North Saskatchewan. The herd at Fort Pierre, S. D., numbering over 700 animals, contains about one-fifth of all in existence. Other small bands are kept in parks and zoological gardens in various parts of the world. In 1913 there were 3,453 living bison, the sole relic of the millions of these valuable animals, which half a century ago ranged our western plains, and which were recklessly destroyed.

The buffalo herds were made up of small companies, consisting of a patriarchal old bull, several cows and a number of young of various ages, and thousands of these companies would graze in the same region, all moving slowly in the same direction, so that travelers would never be out of sight of bison during a whole day's journey. They were more or less nomadic, wandering from one part of the plains to the other in search of fresh pasturage. Thus on the approach of winter a general movement always took place from the high, central plains toward the warmer south, and also into the shelter of the wooded valleys of the foot-hills. In these journeys they had the habit of traveling in single file, thus forming long narrow paths, which the plainsmen called «buffalo trails,» yet traceable in many places. In spite of their weight and apparent clumsiness, they swam rivers with ease and climbed about the mountains with remarkable ability. Nevertheless they chose the easiest places, and the well-marked buffalo-trails were the guides for explorers, and were most deeply imprinted in those mountain passes, which are now the highways of commerce. The sexes kept together throughout the year, and as is usual among gregarious animals, there was constant fighting among the bulls for the supremacy of their bands, the old leaders being overthrown by younger and more vigorous aspirants, as soon as their strength began to wane. Thus the very best sires were continually selected by the law of battle, and the race kept at its highest point. The herding was a measure of protection against the enemies which hung upon the skirts of every band. The grizzly bear was perhaps the only animal that could vanquish a bison bull in fair fight, but pumas and wolves were ever on the watch to seize any young or feeble ones that strayed from the band. When attacked the band would instantly form a close crowd with the cows and calves in the centre, protected by the bulls, forming a circle with lowered heads on the outside. The calves were born in the spring, a single one, as a rule, to each cow after a gestation of about nine months.

To the western Indians the bison was the principal resource for food and shelter, and was continually hunted. In the days before firearms, the Indians would approach them on foot, by creeping within bowshot on all fours, often disguised in the skin of a calf or an antelope; or would rush the herd upon horseback. They also had the practice in rough countries of driving the buffaloes into enclosures or small canyons, where they could easily be slaughtered; or sometimes would force them over a cliff, to be killed by the fall. Besides eating the flesh as fresh meat, vast quantities of it would be cut into strips each autumn, and dried in the sun for winter use; while the northern tribes chopped it into fine pieces, mixed it with berries, and preserved it in skin bags, mixed with boiled fat, and so formed the highly portable and nutritious food called «pemmican.» The disappearance of the buffalo consequently meant starvation to the Indians, as well as the loss of the principal material for warm clothing and bedding, and the Indian wars which raged upon the plains, during the third quarter of the 19th century, were mainly due to the desperate efforts made by these people to preserve their hunting-grounds.

Species of fossil bison have been found both in Europe and America, associated with the remains of mammoths, mastodons and other extinct animals of the Quaternary Period. Some of these extinct bison exceeded in size any of the living species, the bony horn-cores in one being six feet from tip to tip (the length of the horns themselves must have been considerably greater); the height of this species is estimated to have been over six feet at the shoulder.

The literature relating to the American buffalo is as extensive as the story of the Western States. The most complete and special accounts are J. A. Allen's monograph, ‹The American Bison› republished by the United States Geological Survey in 1875; and W. T. Hornaday's ‹Extermination of the American Bison,› in the annual report of the Smithsonian Institution for 1887; ‹Our Vanishing Wild Life,› also by Dr. Hornaday (New York 1913); and the *Annual Reports* of the American Bison Society. For the more picturesque and adventurous side of the animal's history, and its hunting, consult Audubon's ‹Quadrupeds of America›; Catlin's ‹North American Indians›; Gregg's ‹Commerce of the Prairies›; Dodge's ‹Black Hills›; Butler's ‹Great Lone Land›; Inman, ‹Buffalo Jones: Forty Years of Adventure› (1899); and the accounts of western explorations by such writers as Pike, Fremont, Marcy, Long, Emory and Stansbury.

BISPHAM, bĭs′păm, **David Scull,** baritone singer: b. Philadelphia, Pa., 5 Jan. 1857, of Quaker parentage. Educated at Haverford College, Pennsylvania, he later studied music and singing in England and Italy. His début was made as the Duc de Longueville in ‹The Basoche,› London, in 1891, and since then he has been the principal baritone of the Royal Opera Company, Covent Garden, London, and the Metropolitan Opera Company, New York. An accomplished linguist, he is equally at home in German, French or Italian, but his greatest successes have been in Wagnerian rôles, such as «Alberich» and «Wolfram.» He abandoned the operatic stage for concert singing in which he has been eminently successful. He is a staunch advocate for the use of English in opera and has achieved a large measure of success in his rendering of German songs in English translations.

BISSAGOS, bĭs-sä′gōz, a group of islands, about 20 in number, near the west coast of Africa, opposite the mouth of the Rio Grande, between lat. 10° and 12° N., long. 18° W., belonging, like the mainland opposite, to Portugal. The largest, Orango, is about 25 miles in length, and most of them are inhabited by a rude negro race. The inhabitants cultivate maize, bananas and palms, but their chief employment is in fishing. Most of the islands are under native chiefs, who are nominally vassals of Portugal. At Bolama or Bulama, once a British settlement, but abandoned in 1793, there is a thriving Portuguese town, which is the seat of government. Consult Antichan, ‹Les Iles Bissagos› (*Revue de géographie* 1881, 1882).

BISSÃO, bẹs-sä′o, an island and Portuguese station closer to the African coast than the Bissagos and opposite the Jeba's delta. Before the prohibition of slavery by the Portuguese government it was an important slave market. It is the chief port of Portuguese Guinea.

BISSELL, Edwin Cone, American biblical scholar: b. Schoharie, N. Y., 2 March 1832 d. Chicago, 9 April 1894. He prepared for the ministry at Union Theological Seminary, New York and held Congregational pastorates at Westhampton, Mass., San Francisco, Cal., and Winchester, Mass., and was professor of Hebrew in the Hartford Theological Seminary, 1881–92, and at the McCormick Presbyterian Seminary, Chicago, 1892–94. He published ‹The Historic Origin of the Bible› (1873); ‹The Pentateuch: Its Origin and Structure› (1885); ‹Biblical Antiquities› (1888); ‹Genesis Printed in Colors, Showing the Original Sources from which it is Supposed to Have Been Compiled› (1892); ‹The Apocrypha of the Old Testament, with Historical Introductions,› his greatest work (1880).

BISSELL, George Edwin, American sculptor: b. New Preston, Conn., 16 Feb. 1839; d. Mount Vernon, N. Y., 30 Aug. 1920. His works include a bronze statue of Chancellor John Watts in Trinity churchyard, Col. Abraham de Peyster at Bowling Green, and ‹Lycurgus,› a marble statue on the appellate court-house, in New York city: Chancellor James Kent in the Congressional Library, Washington; the Elton Memorial Vase and a statue of Col. John L. Chatfield at Waterbury, Conn.; a bronze statue to Abraham Lincoln in Clermont, Iowa; a monument to Lincoln in Edinburgh, Scotland; and numerous soldiers' monuments throughout this country, the best of which is at his early home in Waterbury, Conn. In early life he served as a private in the Civil War, 1862–63, and in the United States navy, as assistant paymaster, 1863–65. The son of a prosperous quarryman, he was associated with his father and brother in the marble cutting business in Poughkeepsie, N. Y., and comparatively late in life completed his art studies in Paris, Florence and Rome in 1875–76. He maintained studios in Paris 1884 to 1896 and in Florence 1903–05 and 1907–09. His work is distinguished by virility and life-like realism.

BISSELL, Wilson Shannon, American lawyer: b. New London, N. Y., 31 Dec. 1847; d. Buffalo, 6 Oct. 1903. He was graduated at Yale University in 1869; and studied law in Buffalo with Lansing, Cleveland & Folsom. In 1872 he formed a partnership with Lyman K. Bass, the firm of which Grover Cleveland became a member in 1873. When Mr. Cleveland was elected governor of New York the firm was dissolved. Subsequently it was reorganized, and in 1900 consisted of Bissell, Carey & Cooke. He was a delegate to several State conventions; in 1884 was a Democratic presidential elector; and in 1893–95, during Mr. Cleveland's second term as President, was Postmaster-General of the United States. He became chancellor of the University of Buffalo, 1902.

BISSEN, bĭs′sĕn, **Hermann Wilhelm,** Danish sculptor: b. Schleswig 1798; d. Copenhagen, 10 March 1868. From 1823 to 1833 he studied in Rome under Thorvaldsen, who in his will commissioned him to complete his unfinished works. In 1850 he was made director of the Academy of Arts, Copenhagen. Among his masterpieces are the ‹Valkyrie,› ‹Cupid Sharpening His Arrow,› and ‹Moses›; his ‹Orestes,› and a frieze 134 feet long, destroyed in the burning of the Christianborg at Copenhagen (1884). The royal collection in Copenhagen possesses 100 bronze busts, and numerous statues and casts.

BISSEXTILE, the ancient name of leap year, so called from the sixth day before the calends of March being repeated or taken twice. See Calendar.

BISSING, Baron **Moritz Ferdinand von,** German soldier; governor-general of Belgium, 1914–17: b. Bellmannsdorf, Silesia, 30 Jan. 1844; d. Brussels, 18 April 1917. He entered the Prussian army at 19, served in the Austrian campaign (1866) and the Franco-Prussian War of 1870–71, attaining the rank of full general in 1902. Up to the time of his retirement in 1908 he had held several high commands. He was succeeded in his command of the 7th German Army Corps at Münster by General von Bernhardi (q.v.). Bissing was recalled to the service on the outbreak of the European War, and in November 1914 he superseded General von der Goltz as governor-general of the conquered territory of Belgium. During his tenure of that office the name of Baron Bissing acquired much unenviable prominence on account of the stern régime he introduced over the Belgian population. Responsibility has been laid on his shoulders for the levying of millions of dollars from various towns for alleged infractions of German military laws; for the execution of Edith Cavell (q.v.); and for the wholesale deportation of Belgians into Germany. There are strong indications, however, that Bissing was rather the obedient instrument in carrying out these rigorous measures than the instigator of them. While his signature certainly appeared under all the proclamations and drastic restrictions imposed upon the Belgian people, and his assent was given to many «executions,» the *Berliner Tageblatt* stated after his death that «most of the measures taken under his governorship created a world-wide sensation and aroused a world-wide protest. They were not taken by him, but in spite of his efforts to prevent them.» It is known that Bissing was opposed to the killing of Edith Cavell; that he tendered his resignation to the Kaiser over the affair, and that he was also opposed to the deportations. Both of these measures — according to the German paper quoted — were ordered from the Kaiser's headquarters. Particular interest attaches to a document entitled «General von Bissing's Testament,» published after his death. In a letter to Dr. Stresemann (14 Jan. 1917) von Bissing declared that Germany must on no account relinquish Belgium, which «must be used to enhance our power.» He confessed that his policy in Belgium had been guided by «such consideration of what may happen in the future. Great difficulties have often been put in the way of my policy, and the policy of the fist alone has been set up as the right policy.» His church policy had been conducted «with a wise moderation» because «we shall need the church when some day we want to develop German ways and German activity in Belgium.» On the subject of the «Testament» he wrote, «There lies in my house a memorandum composed by me for myself alone, which deals more precisely and exhaustively with the future of Belgium, and the conclusion I arrive at is this, that, if we do not get Belgium into our sphere of power, and if we do not govern it in German fashion (and use it in German fashion) the war is lost . . .» The memorandum referred to was published by a member of the Reichstag in the *Bergische Märkische Zeitung* a month after Bissing's death. The writer develops his theories with much ingenuity, advancing numerous political and economic reasons why Belgium must in the future become a German possession. He realizes the difficulty «that we shall ever be able to conclude with the King of the Belgians . . . a peace by which Belgium will remain in the German sphere of power,» and that «in view of our just and ruthless procedure, the King of the Belgians will be deposed, and will remain abroad as an aggrieved enemy. We must put up with that . . . and we can read in Machiavelli that he who desires to take possession of a country will be compelled to remove the King or Regent, even by killing him.» One of the necessary methods to be employed in Germanizing Belgium is, in von Bissing's opinion, that «he who remains in the country must declare his allegiance to Germany, and after a certain time must declare his allegiance to Germanism.» Furthermore, «it cannot be tolerated that wealthy Belgians shall leave the country, and nevertheless draw profit from their possessions in Belgium.» In order to prevent this, «expropriation is absolutely necessary.» The possession of the Belgian Kongo «is certainly to be aimed at, and I desire to insist that a German colonial empire, whatever its shape, is indispensable for Germany's world policy and expansion of power.» The memorandum was written toward the end of 1915.

BISSON, bẹ-sôṅ, **Alexandre,** French dramatist and musical composer: b. 1848. His vaudeville, ‹Four Cuts with a Penknife› (1873), won for him instant celebrity. ‹The Deputy from Bombignac› is his masterpiece (1884), unless we prefer to this ‹Les Surprises du Divorce› (1890), in which he had the benefit of the collaboration of Antonio Mars. Other comedies or operettas were ‹The Late Toupinel›; ‹The Joys of Paternity›; ‹The Pont-Biquet Family.› With Théodore de Lajarte he was joint author of a ‹Grammar of Music› and of a ‹Little Encyclopædia of Music.›

BISTINEAU, bĭs-tẹ-nō′, a lake in northwestern Louisiana, dividing Bossier and Bienville parishes, about 30 miles in length from north to south and two in breadth. It receives the Dauchite River from the north, and communicates with Red River by an outlet at its southern extremity. It is navigable for steamboats.

BISTORT (*Bistorta*), perennial plants of the buckwheat family; from their astringent properties (they contain much tannin) sometimes used medicinally. They are also called adder's-wort and snake-weed, from being a supposed remedy against snake-bites. Some species occur in Europe and Asia, and several are found in North America, chiefly at high altitudes.

BISTRE, bĭs′tėr, a reddish brown water-color, generally obtained from the soot that collects in chimney-flues. This is pulverized and washed to remove the saline ingredients. The finest sediment is then dissolved in vinegar, to which gum-water is afterward added. It was formerly much used for making painters' crayons, and also for a paint in water-color designs. Sepia, however, is now preferred to it, as it has a more agreeable color and is more easily employed.

BISULPHIDE. See ELECTRO-CHEMICAL INDUSTRIES.

BITHRON, Hebrew «the gorge»: in biblical history a ravine leading to the city of Mahanaim, which city was situated on the borders of Gad and Manasseh.

BITHUR, bẹ-thoor′, India, town 12 miles northwest of Cawnpore, on the right bank of the Ganges, in the United Provinces of Agra and Oudh. In the Indian mutiny it had some notoriety conferred on it from being the residence of Nana Sahib, also styled the Rajah of

Bithur. The town was long the abode of a line of Mahratta chiefs, the last of whom died without issue in 1851. His adopted son, Nana Sahib, whose proper name, however, was Dhundoo Punt, claimed the succession, but his title was ignored by the East India Company, a proceeding which is believed to have stimulated him to his subsequent deeds of atrocity. General Havelock gained a brilliant victory over the rebels in the vicinity, and subsequently quantities of treasure belonging to the Nana were discovered by the troops in a well close to the palace. Bithur is devoted to the worship of Brahma, and contains numerous pagodas and ghats. It is a favorite place of pilgrimage for ablution purposes. Pop. 4,386.

BITHYNIA, anciently a country in Asia Minor, on the Black Sea, the Bosporus and the Sea of Marmora, and bounded on the south by Phrygia. In early times it was called Bebrycia, from the Bebrycians who inhabited it. Before the time of Crœsus, Bithynia was an independent state, under its own princes. After the death of Prusias I, in the war against Crœsus, it fell into the power of the Lydians, 560 B.C.; into that of the Persians, 555 B.C.; and into that of Alexander, 334 B.C. The restorer of the Bithynian throne was Bias or Bas, a native prince, at the court of one of whose successors, Prusias II, Hannibal took refuge, and where he ended his life by poison, 183 B.C. Nicomedes, the last king of this race, bequeathed his kingdom to the Romans, 75 B.C. Pliny the Younger was governor of Bithynia under Trajan in 103–05 A.D. His letters to the Emperor are of interest in regard to the condition of the country and also because of the allusion to the Christians. Diocletian resided habitually at Nicomedia. The famous cities of Nicomedia, Nicæa and Heraclea, were in Bithynia, as also the famous Greek colonies of Chalcedon and Pontica. In the 11th century Bithynia was conquered by the Seljuks. In 1298 a new kingdom was founded there by the Ottoman Turks, of which, in 1327, Prusa was the capital. Consult Ramsay, ‘Historical Geography of Asia Minor’ (London 1890).

BITING-LICE. See BIRD-LICE.

BITLIS, bĭt-lēs', Armenia, town, capital of the Bitlis vilayet and sanjak, on the Bitlis Chai, a tributary of the Tigris, and on the road leading south to Persia from Mush, Erzerum and Lake Van. Situated 5,100 feet above sea-level, the town, built on the hillsides along the river gorge and two tributary streams, has a picturesque site dominated by a striking old castle in decay, the foundations of which are attributed to Alexander the Great. Mosques, colleges, Armenian churches and monastery, an American mission and school are prominent features, and in the busy bazars a considerable trade is carried on in local produce, tobacco, manna, gums, fruits, coarse red cloth, wool and in cotton fabrics, arms, gold and silver articles. A point of strategic importance from ancient times, near here the Persians defeated Suliman the Magnificent in 1554. During the great World War after the capture of Erzerum 16 Feb. 1916 the Russians, pushing steadily forward, occupied Mush 18 February, and Bitlis 2 March. Pop. about one-third Armenians, 36,000.

BITON, bī'ton, Greek mathematician, of uncertain date, but supposed to have been a contemporary of Archimedes, wrote a work of some interest on warlike engines, and dedicated it to Attalus, King of Pergamos. It is to be found in the ‘Mathematici Veteres’ of Thevenot. (2) The son of Cyclippe mentioned in the legend of Cleobis and Biton.

BITONTO, bē-tōn'tŏ, Italy, city of Bari province, 10 miles by rail west of Bari. A fine Romanesque cathedral, the Sylos-Labini palace, the mediæval walls and a large orphan asylum are prominent features. Trade is chiefly in olive oil and Zagarello wine. Known only from coins as ancient Butuntum, here in 1734 the Spaniards' defeat of the Austrians gave Naples to Don Carlos. Pop. 33,000.

BITTER, Arthur, pseudonym of SAMUEL HABERSTICH, Swiss poet and story writer: b. Ried, near Schlosswyl, 21 Oct. 1821; d. Bern, 20 Feb. 1872. Novelettes, stories and poems proceeded from his pen for many years, all characterized by sympathy of tone and inoffensive realism, ‘Tales, Romances and Poems’ (1865–66), being the most pleasing.

BITTER, Karl Hermann, Prussian statesman and writer: b. Schwedt, Brandenburg, 1813; d. 1885. He studied law and politics at the universities of Berlin and Bonn. In 1856–60 he was plenipotentiary of Prussia on the Danube Commission. During the Franco-Prussian War he was prefect of the Vosges. In 1879 he was appointed Minister of Finance and in this office he showed remarkable ability. Through his efforts Hamburg joined the Zollverein or Customs Union, the railroads of Germany were brought under government control, Prussia's finances were placed on a sound basis, a tax was placed on the Börse, and the indirect taxes were increased on tobacco, spirits and malt. Because of differences with Bismarck he resigned in 1882. As a litterateur he confined himself almost exclusively to works on music. His principal work ‘Gesammelte Schriften’ appeared in 1884.

BITTER, Karl Theodore Francis, Austro-American sculptor: b. Vienna, Austria, 6 Dec. 1867; d. 10 April 1915. He studied at the Vienna Academy with August Kuehne and Edmund Heller. He came to the United States in 1889 and soon acquired world-wide reputation. He won the competition for the Astor Memorial bronze doors in Trinity Church, New York. He executed the sculpture on the main buildings of the World's Columbian Exposition, and was appointed director of sculpture at the Pan-American Exposition at Buffalo, the Louisiana Purchase Exposition at Saint Louis and the Panama-Pacific International Exposition, San Francisco 1915. He executed much decorative sculpture for many buildings in New York and other cities, notably the Chamber of Commerce and the Metropolitan Museum, New York, and the Pennsylvania Railroad station, Philadelphia. He also executed a number of bronze and marble statues of a high order, including the Villard Memorial, New York, the Hubbard Memorial (‘Thanatos’), the equestrian statue of Gen. Franz Sigel, and the Carl Schurz Memorial, all in New York; the bust of Dr. Pepper in Philadelphia. He was awarded gold medals at Buffalo 1901, Philadelphia 1902, Saint Louis 1914. He was elected to the National Academy in 1902, and was also a member of the National Academy of Arts and Letters.

BITTER ALMONDS. In medicine the oil of bitter almonds, containing prussic acid, is used as a gastric sedative and as an antispasmodic. See PRUSSIC ACID.

BITTER ASH, the quassia tree. See QUASSIA.

BITTER-ROOT, *Lewisia rediviva,* a plant of Canada and part of the United States, family *Portulacaceæ,* so called from its root being bitter though edible, and indeed esteemed as an article of food by whites as well as Indians. From the root, which is long, fleshy and tapering, grow clusters of succulent green leaves, with a fleshy stalk bearing a solitary rose-colored flower rising in the centre, and remaining open only in sunshine. Flower and leaves together, the plant appears above ground for only about six weeks. It is the State flower of Montana. California bitter-root (*Marah fabacea*) belongs to the gourd family.

BITTER ROOT MOUNTAINS, a range of the Rocky Mountains, in Montana, deriving its name from a plant with rose-colored blossoms, whose slender roots are used by the Indians for winter food. The chief summits are Lolo Peak and Saint Mary's Peak.

BITTER ROOT RIVER, a tributary of the Columbia in Montana, flowing north into Clark's River in Missoula County; length about 110 miles. Gold has been found in this region.

BITTER ROOT VALLEY, a valley on the east of the Bitter Root range, in Montana, 90 miles long and seven miles wide, enwalled by lofty mountains, and abounding in farms and cornfields.

BITTER SPAR, rhomb-spar, the crystallized form of dolomite or magnesian limestone. The name is derived from the magnesia contained in it, the taste of salts of magnesia being bitter.

BITTER-SWEET, MATRIMONY VINE, or **WOODY NIGHTSHADE,** *Solanum dulcamara,* a sprawling vine of the family *Solanaceæ,* native of Europe and Asia, and introduced into the United States. It has purplish or blue flowers arranged in cymes which are succeeded by attractive inedible berries. The leaves have been used medicinally in the form of an extract. The name, properly false bitter-sweet, is given also to *Celastrus scandens,* a handsome climber of the family *Celastraceæ* found from eastern Canada to South Dakota and southward. It often grows 20 feet tall and is most attractive on account of its orange-yellow fruits which split open and expose the crimson seeds. Both seeds and fruits remain attached to the plants during the winter.

BITTER VETCH, a name applied to two kinds of leguminous plants: (1) *Ervum ervilia,* a lentil cultivated for fodder; and (2) all the species of *Orobus,* for example, the common bitter vetch *O. tuberosus,* a perennial herbaceous plant with racemes of purple flowers and sweet edible tubers.

BITTERN, a bird of the heron family and genus *Botaurus,* several species of which exist in various parts of the world. The bitterns differ from the herons in their lesser size, shorter neck, comparative shortness of the legs, and superior length of toes, and in their nocturnal habits and loud voices. Otherwise their haunts, food and manner of life closely resemble those of herons (q.v.). The only North American species is the common bittern (*B. lentiginosus*), which is spread throughout the United States and southern Canada in all suitable places, often close to towns. Its length is about 25 inches, and the plumage is tawny brown of various shades, excessively variegated everywhere; the neck is striped with dull yellow and has on each side a dark patch. Both sexes, and the young, are alike in plumage. The Old World species (*B. stellaris*) is very similar, but has more red on the upper parts, and green about the head. It is found numerously from Ireland to Japan, in India and throughout Africa. Other species or varieties spread the range of the genus to New Zealand and the South Sea Islands. The one great peculiarity of the bitterns, to which they owe their Latin and many local names, is their extraordinary vocal utterance in spring, which in the European species is likened to booming by everyone who has heard it, and has been called «a loud and awful voice.» The old fable that this sound was produced in some mysterious way by the bird while it held its beak plunged into the mud is untrue; and the flesh is no longer esteemed as a dainty, as it was some centuries ago. The voice of the American bittern is a droning, thumping noise, which has been likened to the driving of a stake with an axe, or, more often, to the working of an old-fashioned pump-handle. Hence the rural names, «stake-driver,» «mire-drum,» «bog-pumper,» «thunder-pump,» and the like. Nuttall attempted to suggest the sound of the syllables «pump-au-gah»; but Samuels succeeds better. He writes: «In the mating season, and during the first part of the period of incubation, the male has a peculiar love-note, that almost exactly resembles the stroke of a mallet on a stake; something like the syllables ‹chunk-a-lunk-chunk, quank-chunk-a-lunk-chunk.› I have often, when in the forests of northern Maine, been deceived by this note into believing that some woodman or settler was in my neighborhood, and discovered my mistake only after toiling through swamp and morass for perhaps half a mile.»

A genus of smaller birds, *Ardetta,* is known as that of the «least bitterns.» One species (*A. exilis*) occurs over most of North America, and related species belong to South America. They are intermediate between the true bitterns and the night herons.

Consult Coues, ‹Birds of the Northwest› (1874); and Newton, ‹Dictionary of Birds› (1896), and the other authorities therein cited.

BITTERN, or **SALT OIL,** the name given to the syrupy residue from evaporated sea-water after the common salt has been taken out of it. The syrup contains salts of magnesium, which give it a bitter taste, and it is employed as a source of them. It is also one of the sources of bromine. Bittern procured from the salt works at Epsom, England, was formerly the source of sulphate of magnesium, hence styled Epsom salts. See SALT.

BITTERNUT. See HICKORY.

BITTERS, a popular name for a class of compounds largely employed as appetizers and digestants. They are for the most part alcoholic drinks to which some plant containing a bitter principle is added. The bitter principles are either alkaloids, as in the quinine of calisaya, or amaroids, which are widely distributed in plants. The most commonly employed bitters are quassia, gentian, angostura, cascarilla, wild cherry and cinchona. Medicinally bitters are classed as simple and aromatic, the latter containing volatile oils in addition to the bitter principles. The simple bitters mostly used are quassia, gentian and calumba. The aromatic bitters are cascarilla, eupatorium (boneset), angostura, serpentaria and chamomile.

BITTERWOOD, various trees and shrubs of the genus *Xylopia* of the family *Annonaceæ,* noted for the bitterness of their wood which is used for furniture because of its resistance to insects. One Brazilian species (*X. sericea*) furnishes a peppery fruit and a cordage fibre. The name bitterwood is also given to *Simaruba excelsa* belonging to the family *Simarubaceæ.* This tree is a native of the West Indies and is used like quassia.

BITTINGER, Lucy Forney, American historical writer: b. Cleveland, Ohio, 29 Aug. 1859; d. 1907. She has published ‹Memorials of Rev. J. B. Bittinger› (1891); ‹History of the Forney Family of Hanover, Pennsylvania› (1893); and ‹The Germans in Colonial Times,› (1901), a work of much value.

BITUMEN, a general term loosely used to designate almost any asphaltic or tarry substance, but properly restricted to those naturally occurring. The distinctive features of true bitumen are that it occurs in native form, and that it is soluble in benzol, and in carbon disulphide. It is found in nature in gaseous form in natural gas; in liquid form in petroleum and maltha; and in solid form in the mineral waxes (ozokerite, montan wax and hatchettite), in asphaltum, and in the asphaltites (gilsonite, glance pitch, manjak and grahamite). The pitch of the celebrated «Pitch Lake» of Trinidad contains about 40 per cent of true bitumen. The production of solid bitumen in the United States in 1916 amounted to: gilsonite, about 20,500 tons, valued at $500,000; grahamite, 8,431 tons, valued at $92,555; and ozokerite, 4 tons, valued at $3,800. The gilsonite was used chiefly in the manufacture of paints, varnishes, japans, insulations and rubber substitutes. Grahamite is used principally in the making of ready roofing, artificial rubber and varnish. Ozokerite is a constituent of polishes for shoes and leather goods, and is also used in candles and sealing wax. The United States imported 1,504 tons of ozokerite in 1916 (see ASPHALT). The bitumens are probably all of vegetable origin, and while not confined to any particular geological formation, they occur most abundantly at or near the earth's surface, often in connection with rocks containing organic remains.

BITUMEN PROCESS, the first known method of fixing the image of the camera, so as to make it permanent. The blackening action of light upon salts of silver was known in the 18th century, but no method was found for fixing the image obtained with salts of silver until about 1838. The bitumen process was perfected in 1827 by a Frenchman, Nicephore de Nièpce. He coated plates of metal with a solution of asphaltum in oil of lavender, and then, after drying them, he exposed them for a prodigious length of time in a camera. A very faint image was the result. The plate was subsequently immersed in a developer consisting of one part of oil of lavender and 10 parts of petroleum, which slowly dissolved the parts unaffected by light, leaving a permanent picture formed of those parts of the asphaltum that the light had rendered insoluble. Subsequently Daguerre became associated with Nièpce, and together they improved the bitumen process until Daguerre said that «the time required to procure a photographic copy of a landscape is from seven to eight hours; but single monuments, when strongly lighted by the sun, or which are themselves very bright, can be taken in about three hours.» See CAMERA; DAGUERRE; PHOTOGRAPHY.

BITUMINOUS COAL, popularly called «soft coal,» in distinction from anthracite. It is denser and less woody than brown lignite. In color it is a dull black, rarely lustrous, soils the fingers readily and burns with a yellow smoky flame. Bituminous coal is characterized by cleavage planes at right angles to each other, so that it breaks up readily into cubical blocks and fragments. The composition of a typical Pennsylvania bituminous coal shows: fixed carbon, 55 per cent; volatile matter, 38 per cent; ash, 5 per cent; moisture, 2 per cent. Subbituminous is a term applied to black lignite, a grade between brown lignite and bituminous coal, while semi-bituminous is a grade higher than bituminous and lower than semi-anthracite. The known coal areas of the United States include 242,000 square miles of bituminous coal deposits, and 97,000 square miles of semi-bituminous deposits. It is estimated that these areas contain 1,375,000,000,000 tons of bituminous coal and 47,700,000,000 tons of semi-bituminous coal. The largest areas worked are in Pennsylvania and West Virginia, in the Appalachian field; and in Illinois in the Mississippi basin. The official preliminary estimate of the 1916 production of bituminous coal in the United States is 509,000,000 tons. Of this output the railroads commonly use about 125,000,000 tons, and the coke ovens, 65,000,000 tons. Manufacturers and power plants consume 180,000,000 tons, and hotels, schools, etc., 100,000,000 tons. See COAL.

BITZIUS, Albert (pseud. JEREMIAS GOTTHELF), Swiss author: b. at Murten in Switzerland, 4 Oct. 1797; d. in Lützelflüh im Emmental in Switzerland, 22 Oct. 1854. He belonged to a family of pastors, and after studying theology in Bern and Göttingen and traveling in Germany, he became first vicar and in 1832 pastor in Lützelflüh, which position he occupied until his death. He did not begin writing until late in life. His first work, ‹Der Bauernspiegel, oder die Lebensgeschichte des Jeremias Gotthelf› appeared in 1836. It sketches the development of a poor country orphan boy, but is not an autobiography. Henceforth Bitzius was a prolific writer and in the last 18 years of his life became one of the important novelists not only of Switzerland but of the German language in general. He was not a conscious artist, but was nevertheless wonderfully gifted by nature. He saw things as they were, was susceptible to all impressions of life and reproduced them in true fashion — a genuine realist, though not a naturalist. He knows the peasant folk of his native country with all their fads and foibles. He sketches his characters with epic simplicity and yet elevates them into the domain of the universal. His peasant world is a mirror of the world in general. His greatest work is ‹Uli der Knecht› (1841). It tells the story of a poor peasant laborer who develops into the owner of a prosperous farm. A plain theme, to which the epic imagination of Bitzius gives universal application. Vreneli, the chief woman character, charms us by the nobility and purity of her soul. Another novel almost on the same plane is ‹Uli der Pächter› (1849). Three other novels may be classed in importance with Uli; ‹Anne Bäbi Jowäger› (1843–44); ‹Geld und Geist› (1842–46); and ‹Käthi, die Grossmutter› (1847). One of his short stories, ‹Elise die seltsame Magd› (1850) was particularly attractive to Gottfried Keller. Other works of lesser importance are ‹Leiden und Freuden eines Schulmeisters› (1838); ‹Fünf Mädchen› (1838); ‹Dursli, der Branntweinsäufer› (1839); ‹Die Käserei in der Vehfreude› (1850); ‹Zeitgeist und Bernergeist› (1852). Bitzius is an interpreter of peasant psychology. In the writing of country and village stories he was a pioneer, and in his ideas on social betterment he pointed to the future. At times the preacher and reformer obtrudes and endangers the artistic effect, but we must admire the sincerity of his desire to ameliorate the condition of the poor. Consult Muret, Gabriel, ‹Jeremie Gotthelf› (Paris 1913); also Roedder, E. C., in Vol. VIII of ‹The German Classics› (New York 1914).

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BIVALVES, those mollusks of the class *Pelecypoda,* whose coverings consist of two concave shell plates or valves.

Bivalves (for example, the clam), are entirely protected by the valves, which are connected by a hinge, consisting of a large tooth or teeth (usually three), and a ligament. In the clam both valves are alike, in the scallop the hinge margin is eared, and the shell is marked with radiating ridges, while in most bivalves there are simple lines of growth. On the interior, which is usually lined with mother-of-pearl, are either one (in oysters and scallops) or two (clams, etc.) roundish muscular impressions made by the single or the two adductor muscles by which the valves are closed. The shell is often covered by an epidermis. The hinge is situated directly over the heart, and is therefore dorsal or «hæmal.» The shell is secreted by the thickened edge of the mantle or body-walls. There is in bivalves in distinction from snails (*Gastropoda*) no head, and the mouth is not armed with teeth or a lingual ribbon, present in snails. The mouth is small with soft lips, and in each side is a pair of labial palpi. The short œsophagus opens into a small stomach which receives the contents of the liver. The long intestine is coiled in the visceral mass, the solid disc-like portion of the body in the clam and oyster; the intestine also usually passes through the ventricle of the heart, and then ends opposite the upper division of the siphon. This heart is three-chambered, consisting of a ventricle and two auricles. The siphon forms the so-called head of the clam, though it is situated at the posterior end of the body; it forms a double tube, ending in an excurrent and incurrent orifice surrounded by a circle of tentacles which are sensitive to the touch. The siphon is very long in the clam (*Mya*) and other bivalves which burrow in the sand or mud and live in deep holes. Locomotion is effected by the so-called «foot,» which is a wedge-shaped or hatchet-shaped fleshy tongue-like mass situated at the front end under the mouth. Its hatchet-shape gives the name *Pelecypoda* to the class. This foot is enormous in the razor-fish, which burrows with extreme rapidity in the sand. In fixed bivalves, such as the oyster and mussel, the foot and siphon are reduced by atrophy or are entirely wanting. There being no head, there are usually no eyes, except in the scallops, where they are numerous, large and situated on the thickened edge of the mantle. Bivalves breathe by one pair, more usually two pairs, of leaf-like gills, situated on each side of the visceral mass. The individuals are usually bisexual, each being male or female. The nervous system consists of three pairs of ganglia, connected by a nerve-thread. The supraœsophagal ganglion is the so-called «brain,» being situated over the mouth; the pedal ganglion is in the centre of the foot, while the visceral ganglion is near the middle of the body. Most bivalves possess an organ of the chemical sense and an organ of hearing and of equilibration, a very minute otocyst situated in the centre of the foot, and connected by a nerve with the pedal ganglion. The ovaries are yellowish, voluminous glands forming the larger part of the visceral mass. These mollusks are very prolific, the oyster laying about 2,000,000 eggs.

In the oyster (*Ostrea*) or in *Anomia* the shell is inequilateral, one valve, usually the left and lower one, being fixed to some object, and the intestine does not pass through the ventricle; in *Arca* the ventricle is double. In *Lucina* and *Corbis* there is but one gill on each side, and in *Pecten, Spondylus* and *Trigonia* the gills are reduced to comb-like processes. Contrary to the habits of most bivalves, the scallop can swim and even skip out of the water by violently opening and shutting its shell. *Trigonia* is also capable of leaping a short distance, while *Lima* is an active swimmer. The foot varies much in form; in the mussel, *Pinna Cyclocardia,* and the pearl-oyster it is finger-shaped and grooved, with a gland for secreting a bundle of threads, the *byssus,* by means of which it is anchored to the bottom. The foot in the quohog *Venus,* is large, these mollusks being very active in their movements. In *Glycimeris* the fringe is toothless, much as in the oyster. In *Mactra* the middle tooth of the hinge is large, the corresponding cavity large and triangular. In *Saxicava* and *Panopæa,* the pallial line is represented by a row of dots. In *Macoma* the siphons are very long.

Lithodomus, the date-shell, one of the mussels, bores into corals, oyster shells, etc.; the common *Saxicava* excavates holes in mud and soft limestone, as does *Gastrochæna, Pholas* and *Petricola.* Certain boring lamellibranchs, such as *Pholas,* are luminous.

A very aberrant form of bivalve mollusk is *Clavagella,* in which the shell is oblong, with flat valves, the left cemented to the sides of a deep burrow. The tube is cylindrical, fringed above, and ending below in a disc, with a minute central fissure, and bordered with branching tubules. In *Aspergillum,* the watering-pot shell, the small bivalve shell is cemented to the lower end of a long shelly tube, closed below by a perforated disc like the nose of a watering-pot.

Bivalves, in growing, usually pass through a pre-swimming larval stage called a «trochosphere,» resembling a top, and moved by a circlet or zone of ciliæ. After a while two flaps (*vela*) arise on each side of the mouth, forming *veliger* stage; meanwhile the shells arise, and as they become larger and heavier, the young bivalve sinks to the bottom, and begins to use its «foot» for burrowing. Some bivalves, such as the fresh-water mussel *Unio,* go through a parasitic stage in their development.

Some bivalves arrive at maturity in a single year. The fresh-water mussels live from 10 to 12 years, while the giant clam (*Tridacna gigas*) probably lives from 60 years to a century.

The bivalves began to appear in the Cambrian Period; they became more frequent in the Ordovician and Silurian, but they did not abound until toward the Mesozoic Age, since the seas during the Palæozoic Age were crowded with brachipods. Oysters date from the beginning of the Mesozoic. The genus *Mucula* and its allies are very primitive forms, and nearly allied to the earliest known bivalves. Of about 15,000 known species of bivalves, two-thirds (10,000) are fossil.

The class *Pelecypoda* (or *Lamellibranchiata*) is divided by the gill characters (consult Parker and Haswell's ‹Zoology›) into five orders, namely: (1) *Protobranchia,* (2) *Filibranchia,* (3) *Pseudo-lamellibranchia,* (4) *Eulamellibranchia,* (5) *Septibranchia;* and by Dall, from the hinge-characters, into three ordinal groups: *Prionodesmacea, Anomalodesmacea* and *Teleodesmacea.* In Neumayr's group *Palæoconcha,* now forming a part of the *Prionodesmacea,* are included certain primitive types which appear to have given origin to certain more modern groups. For further information and the literature of the subject see MOLLUSCA.

BIXBY, James Thompson, American author and clergyman: b. Barre, Mass., 30 July 1843. He was graduated at Harvard University, A.B. 1864; A.M. 1867; S.T.B. 1870; Ph.D. Leipzig, Germany, 1885. Served as pastor of Unitarian churches in Watertown, Mass., 1870–74; Belfast, Me., 1875–79; Meadville, Pa., 1879–83; and Yonkers, N. Y., 1887–1903; was professor of religious philosophy in Meadville Theological School, 1879–83, and lecturer on the philosophy of religion at Lowell Institute, Boston, 1876 and 1883. He is a member of the Authors' Club and Authors' League of America. Author of ‹Religion and Science as Allies› (1895); ‹Ethics of Evolution› (1900); ‹The New World and the New Thought› (1902); ‹The Open Secret› (1912); ‹What is Bahaism?› (1912).

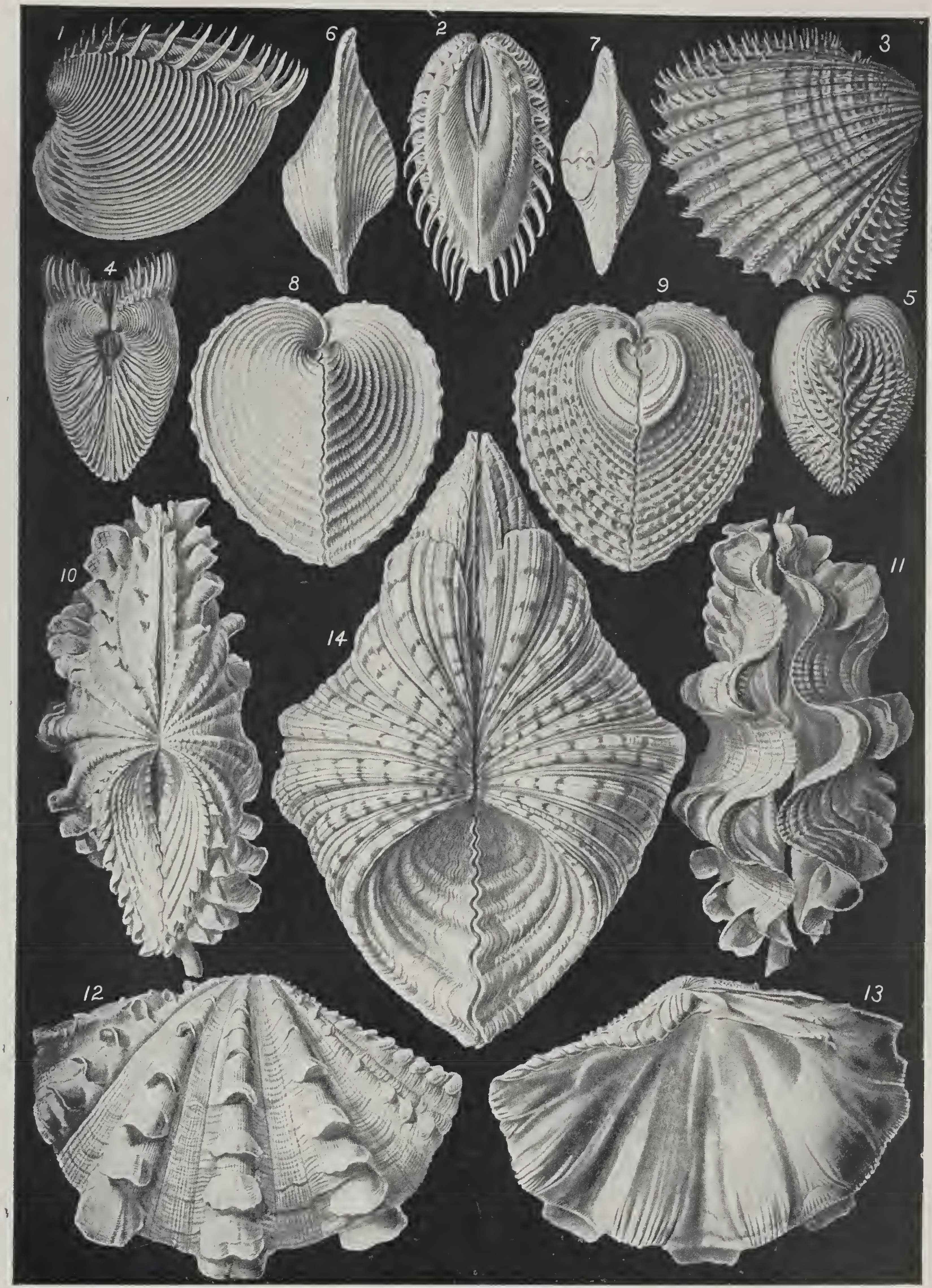
BIXBY, William Herbert, American military engineer: b. Charlestown, Mass., 27 Dec. 1849. A graduate of Massachusetts Institute of Technology and of the United States Military Academy, from 1873 he was assistant professor of engineering in the latter institution. In 1881 he was commissioned for special study in France in the government school of bridges and highways. In 1908–10 he was president of the Mississippi River Commission, and directed the salvage operations of the battleship *Maine* in Havana harbor 1910–11. In 1910 he attained the rank of brigadier-general, chief of the engineer corps in the United States army, and after 40 years of service retired in 1913. He was the author of numerous government reports, ‹A Graphical Computing Table› (1879), and ‹A Discussion of River and Harbor Improvements› (1911).

BIZERTA, Tunis, city and important French naval station on the Mediterranean, 60 miles by rail northwest of Tunis. The old Arab city, citadel and disused harbor are north of the modern fortified city and splendid harbor built, since the French occupation in 1881. A canal 2,600 feet long and 787 feet wide, lined with quays, extends from the centre of the outer port to a large commercial port opening on the historic Lake Bizerta the ancient *Hipponitis Palus* and *Sisaræ Palus* with an area of 50 square miles and depths ranging from 30 to 40 feet. On the lake at Sidi Abdallah are the naval port and arsenal, and Ferryville the military town. The lake abounds in fish, notably mullet, which dried forms *botargo,* a standard article of Mediterranean commerce, along with grain and olive oil. Bizerta dates from the Tyrian colony Diarrhytus or Hippo Zarytus. Fortifications and a new harbor were built by Agathocles, 310–307 B.C. As a Roman colony it was captured by Arabs in the 7th century and had a turbulent history during subsequent centuries. Pop. 18,000.

BIZET, bē'zēt', (ALEXANDRE CÉSAR LÉOPOLD) **Georges,** French composer: b. Bougival near Paris, 25 Oct. 1838; d. Paris, 3 June 1875. ‹Carmen,› his masterpiece, produced at the Opera Comique, 3 March 1875, three months before his death, has achieved great popularity as a standard opera. His less known works are ‹Le Docteur Miracle,› an operetta which received equal honors with one by Lecocq in a competition organized by Offenbach (1857); ‹Les Pêcheurs de Perle,› opera (1863); ‹La Jolie Fille de Perth,› opera (1867); ‹Djamileh,› one-act opera, and incidental music to A. Daudet's drama ‹L'Arlésienne› (1872); son of a vocal teacher and pupil at nine years of age in the Conservatoire of Paris, he distinguished himself as pianist and organist, and in composition with his cantata ‹Cloris et Clotilde› won the Grand Prix de Rome in 1857. During the three years' study course in Italy he wrote part of a symphony, ‹La guzla de l'Emir,› a comic opera, and ‹Don Procopio,› an opera discovered among Auber's papers in 1895. Bizet married Miss Halévy, a daughter of his teacher in composition, 3 June 1865.

BJERREGAARD, byār'rĕ-gärd, **Carl Henrik Andreas,** Danish author: b. Fredericia, Denmark, 24 May 1845. He comes of Viking stock and his family still owns the reputed Viking home. His immediate ancestors were learned men. His father was president of Fredericia College where Carl was educated.

BIVALVES



BIVALVE MOLLUSCA

1–3 Cytheria dione 4, 5 Cardium aculeatum 6–9 Hemicardium cardissa 10–13 Tridacna squamosa
14 Hippopus maculatus

Later he was graduated from Copenhagen University and from the Military Academy, and served five years as lieutenant; was scout in the Schleswig-Holstein War of 1863–64. He came to America in 1873 for political reasons. Not knowing English, nor the manners and customs of the country and being unable to perform much hard manual labor, he suffered intensely, sinking so low as to work a whole winter under a negro as boss. Finally he made a place for himself, beginning as teacher and lecturer. In 1879 he entered the service of the Astor Library and is now assistant librarian of the New York Public Library. His trend of thought and contribution to American civilization lies in his teaching of the inner life, often called mysticism. He has advocated the introduction of the healthier side of Oriental literature and life, and has opposed strenuously all those false and often degrading forms of Orientalism so often preached of late. Besides many articles in magazines and encyclopædias he has written ‘Nature-Worship and Kindred Subjects’; ‘A Sufi Interpretation of Omar Khayyám and Fitzgerald’; ‘The Inner Life and the Tao-Teh-King’ (1912); ‘Jesus, Poet, Prophet, Mystic and Man of Freedom’ (1912); ‘The Great Mother: a Gospel of the Eternally Feminine’ (1913); ‘Sufism: Omar Khayyâm and Fitzgerald’ (1915). He is now engaged in the compilation of ‘A Complete History of Mysticism.’

BJÖRNEBORG, byĕr′ne-bôrg, Finland, seaport town, the Finnish Pori, and district capital of the Äbo Björneborg government, Finland, at the mouth of the Kumo on the Gulf of Bothnia, 76 miles northwest of Äbo. The roadstead cannot accommodate large ships which stop at Räfsö. A large export trade, mostly with England, is carried on in timber, pitch, tar, pine-oil, leather and bricks. Pop. 17,000.

BJÖRNSON, byôrn′sôn, **Björnstjerne,** Norwegian novelist, poet and dramatist: b. Kvikne, 8 Dec. 1832; d. 26 April 1910. He entered the University of Christiania in 1852, and he speedily became known as a contributor of articles and stories to newspapers and as a dramatic critic. From 1857 to 1859 he was manager of the Bergen theatre, producing during that time his novel, ‘Arne’ (1858), and his tragedy of ‘Halte Hulda.’ He was at Christiania part editor of the *Aftenblad* in 1860, then lived several years abroad, and in 1866 became editor of the *Norsk Folkeblad.* In 1869–72 he was co-director of a Copenhagen periodical, and much of his later life was passed abroad. The democratic tendencies to be found in his novels found a practical outcome in the active part taken by him in political questions bearing upon the Norwegian peasantry and popular representation. He was for a long period the leader of the Norwegian Republicans, and the national entity symbolized by the change made in the Norwegian flag on 1 Jan. 1901 is more nearly due to him than to any one else. He was an advocate of Norwegian national rights as against Sweden and lent his aid to the movement which brought about the dissolution of the union in 1905. He was the greatest distinctively Norwegian writer of his day, so intensely national that «the mention of his name in a gathering of his countrymen is like running up the national flag.» He was the chief novelist, probably the chief poet, and, except possibly Ibsen, the chief dramatist of his country's history. In 1903 he was awarded the Nobel prize in literature. In 1880–81 he traveled and lectured in the United States. His dramas include ‘Sigurd Jorsalfar’ (1872); ‘Mary Stuart in Scotland’ (1864); ‘The Newly Wedded Pair’ (1866); ‘Sigurd Slembe’ (1872); ‘The Editor’ (1874); ‘A Bankruptcy’ (1875); ‘The King’ (1877); ‘Leonarda’ (1879); ‘The New System’ (1879); ‘A Glove’ (1883); ‘Beyond Our Strength’ (1883); ‘Geography and Love’ (1885). His verse includes ‘Poems and Songs’ (1870); ‘Arnljot Gilline,’ an epic (1870). Besides the pastoral tales ‘Arne’ (1858); ‘A Happy Boy’ (1860); ‘The Fisher Maiden’ (1868); ‘Synnœve Solbakken,’ he has written the novels ‘The Bridal March’ (1873); ‘Magnhild’ (1877); ‘Captain Mansana’ (1879); ‘The Heritage of the Kurts’ (1884); ‘In God's Way’ (1889); ‘Absalom's Hair,’ etc. (See BANKRUPTCY, A; EDITOR, THE; SIGURD SLEMBE; SYNNOVE SOLBAKKEN.) Consult Boyesen, ‘Essays on Scandinavian Literature’ (1895); Gosse, ‘An Essay on the Writings of Björnson’ (1895); Brandes, ‘Moderne Geister’ (1897); Björkman, ‘Voices of Tomorrow’ (New York 1913); Björnsgaard, ‘Spredte minder fra 50 til 70-aarenes Norge’ (Risor 1911); Boeck, ‘Soldage faa Aulestad’ (Copenhagen 1910); Collin, ‘Björnstjerne Björnson’ (2 vols., Christiania 1903); Payne, ‘Björnstjerne Björnson’ (Chicago 1910).

BJÖRNSTJERNA, byėrn′shĕr-na, **Magnus Frederick Ferdinand,** (COUNT), Swedish statesman and author: b. Dresden, 10 Oct. 1779; d. Stockholm, 6 Oct. 1847. He was educated in Germany, and in 1793 proceeded to Sweden to enter the army. At the storming of Dessau he received a severe contusion from a cannon-ball, but he was able, notwithstanding, to be present at the battle of Leipzig. He afterward concluded the capitulation of Lübeck with General Lallemand, and received the surrender of the fortress of Maestricht. He concluded with Prince Christian Frederick at Moss the convention which was followed by the union of Norway and Sweden. He published ‘The British Rule in the East Indies’ and ‘Theogony, Philosophy and Cosmogony of the Hindus’ (1843), and also some political writings.

BLAAS, bläs, **Eugene von,** Austrian painter, son of Karl von Blaas: b. Albano, Italy, about 1843. He studied under his father and at the Academy of Venice and later in Rome. He settled in Venice and was appointed professor at the academy there. His works include ‘Conversion of the Rhætians by Saint Valentine’; ‘Cimabue and Giotto’; ‘Scene from the Decameron’; ‘Dogaressa Going to Church’; ‘Venetian Balcony Scene’; ‘Bridal Procession in San Marco’; ‘Venetian Masquerade’; ‘Journey to Murano’ (Vienna Museum).

BLAAS, Julius von, Austrian painter, son of Karl von Blaas: b. Albano, Italy, 1845. He studied under his father and also at Rome, where he painted many scenes from the Campagna. He was afterward popular as a portrait painter at the Austrian court, and was made professor at the Academy of Vienna. His best known works include ‘Race of Intoxicated Slavonic Peasants’ and ‘Antlassritt,’ both in the Imperial Museum, Vienna; ‘Fox Hunt in the Campagna’ (1877); ‘Market in Upper Hungary’ (1885); ‘Horse Fair in Bischofshofen’ (1888).

BLAAS, Karl von, Austrian painter: b. Nanders, Tyrol, 1815; d. 1894. He studied at the Academy of Venice, and in 1837 he was awarded the Roman prize at the Vienna Academy. At Rome he was influenced by Nazarenes and began to devote himself to religious subjects. In 1850 he was made a professor at the Academy of Vienna, removed as professor to the Venice Academy in 1855, but returned to Vienna in 1866. His noteworthy paintings include ‘Jacob’s Journey Through the Desert,’ in the Museum of Vienna; ‘Visitation,’ in the Innsbrück Museum: ‘Charlemagne Visiting a Boys’ School,’ which was awarded a prize at the Paris Exposition of 1855, now in the Venice Museum; ‘Tullia Driving over her Father’s Body’ (1832); ‘Rape of Venetian Brides in the Sixth Century’ (1888), now in the Innsbrück Museum; 33 frescoes in the Altlerchenfeld Church, Vienna; 42 frescoes in the Vienna Arsenal; portraits of Francis Joseph and the Queen of Spain; ‘Ekkehard Carrying the Duchess of Suabia across the Threshold of the Monastery.’ Consult his ‘Autobiographie’ (Vienna 1876).

BLACAS, blä-ka, **Pierre Louis Jean Casimir** (Duc de), French statesman: b. Aulps, 12 Jan. 1771; d. Goritz, 17 Nov. 1839. He was captain of dragoons in 1790 and served in the Vendée. He was cabinet minister in the time of Louis XVIII, and a confidential adviser of the Bourbons; twice Minister to Naples; Ambassador to Rome to negotiate the concordat of 1817; went into exile upon the banishment of Charles X, and offered the King his fortune, which was not accepted. He was so faithful to the Bourbons as to be unpopular with the people. He was a large collector of antiquities and founded the Egyptian Museum at Paris. Consult Vicomte de la Boulage, ‘Notice historique sur M. le duc de Blacas’ (Paris 1840).

BLACK, Adam, Scottish publisher: b. Edinburgh, 20 Feb. 1784; d. there, 24 Jan. 1874. In 1808 he began business as a bookseller, and later with his nephew, Charles B. Black, established a publishing house in Edinburgh. Their most famous publications were ‘Encyclopædia Britannica,’ and the ‘Waverly Novels.’ Adam Black was twice lord-provost of Edinburgh and in 1856–65 represented that city in Parliament. He declined the honor of knighthood and a statue was erected in Edinburgh in recognition of his public services in 1877. Consult Nicolson, ‘Memoirs of Adam Black’ (London 1885).

BLACK, Alexander, American author: b. New York, 7 Feb. 1859. He was educated at the grammar schools of Brooklyn, and at the age of 15 was a reporter on the Brooklyn *Times*, was stenographer in Brooklyn courts 1882–86, literary editor of the Brooklyn *Times* 1885–95, and Sunday editor of the New York *World* 1905–10. From 1910 to 1913 he was managing editor of *Frank Seaman, Inc.*, and since 1913 editor of *Newspaper Feature Service*. He invented «picture plays» in 1893, and brought out first «plays on a white sheet» in 1894. He has published ‘The Story of Ohio’ (1888); ‘Photography Indoors and Out’ (1894); ‘Miss Jerry’ (1895); ‘A Capital Courtship’ (1897); ‘Miss America’ (1898); ‘Modern Daughters’ (1899); ‘The Girl and the Guardsman’ (1900); ‘Richard Gordon’ (1902); ‘Thorney’ (1913). He edited Ostrander’s ‘History of the City of Brooklyn and Kings County.’

BLACK, Charles Clarke, American lawyer: b. Mount Holly, N. J., 29 July 1858. He was graduated at Princeton in 1878, studied law and was admitted to the New Jersey bar in 1881. He has since practised in Jersey City, was Democratic candidate for governor of New Jersey in 1904, and judge of the Circuit Court of New Jersey 1908–14, and since 1914 judge of the Supreme Court of New Jersey. He has published ‘Proof and Pleadings in Accident Cases’ (1886); ‘New Jersey Law of Taxation’ (1893); ‘Law and Practice in Accident Cases’ (1900).

BLACK, Frank Swett, American lawyer and politician: b. Limington, Me., 8 March 1853; d. 1913. He was graduated at Dartmouth College in 1875; was editor of the *Journal* in Johnstown, N. Y.; studied law at Troy in the office of Robertson & Foster, and was admitted to the bar in 1879. He won much popularity by his activity in prosecuting the men who murdered Robert Ross in the election riots in Troy in 1892. He continued in the practice of law at Troy until 1898 and afterward practised in New York. In 1895–97, he was a member of Congress, and in 1897–99 governor of New York. He was a successful party leader, holding all the elements of the Republicans together by his resourcefulness. After his term as governor he resumed the practice of law. He was also eminent as a political speaker and at the Republican National Convention at Chicago in 1904 he placed in nomination the name of Theodore Roosevelt.

BLACK, James, American prohibitionist: b. Lewisburg, Pa., 23 Sept. 1823; d. 16 Dec. 1893. He was educated at the Lewisburg Academy, was admitted to the bar in 1846 and practised in Lancaster. He joined a temperance society at the age of 17, and throughout his life was a determined advocate of prohibition and legislation for its enforcement. He was the first to propose the formation of a temperance party, was one of the committee that called a national convention to organize the Prohibition party (q.v.) and was elected its president when the convention met in Chicago, 1 Sept. 1869. At the Columbus, Ohio, convention, 22 Feb. 1872, he was made the first nominee of the party for President of the United States. His ticket received 5,608 votes in the election of that year. He published ‘Is There a Necessity for a Prohibition Party?’ (1876); ‘History of the Prohibition Party’ (1880); ‘The Prohibition Party’ (1885).

BLACK, Jeremiah Sullivan, American jurist and statesman: b. Glades, Somerset County, Pa., 10 Jan. 1810; d. York, Pa., 19 Aug. 1883. At 17 years of age he entered the law office of Chauncey Forward, in Somerset, an eminent member of the bar, and was admitted to the courts in 1830, being still in his minority.

In April 1842 he was appointed by the governor president judge of the judicial district in which he resided, and confirmed by the senate upon a strict party vote. In 1851, when a change in the State Constitution made the judges elective, he was nominated as judge of the Supreme Court by the Democratic convention, before which he was not a candidate. Of the 10 candidates named by the two parties, he obtained the largest popular vote. Under the mode of drawing provided by the Constitution, a three years' term was assigned to him, and he became chief justice of the court. In 1854 he was re-elected to this place, by a majority of 47,000 votes, though the candidate for governor on the same ticket was defeated by 37,000. On 5 March 1857, while engaged in the discharge of his judicial duties at Philadelphia, he received a telegraphic dispatch from President Buchanan, tendering him the appointment of Attorney-General of the United States. He soon after appeared on behalf of the government, in a disputed land claim of California, involving an important principle upon which hundreds of similar cases depended. He achieved a great success, at once becoming famous as a jurist. In December 1860 Mr. Black succeeded Mr. Cass as Secretary of State. After the election of Lincoln, Judge Black retired to his law practice. In 1868 he was counsel for President Johnson in the famous impeachment trial. In 1877 he appeared as counsel for S. J. Tilden before the Electoral Commission. Besides a great jurist, Judge Black was a brilliant conversationalist, classical scholar and powerful orator. Consult Black, C. F., 'Essays and Speeches of Jeremiah S. Black, with a Biographical Sketch' (New York 1885).

BLACK, John, Scottish journalist: b. near Duns, Berwickshire, 1783; d. 1855. Educated at the parish school, he later obtained a clerkship with an accountant in Edinburgh and attended the university; went to London and became (1810) reporter on the *Morning Chronicle,* of which he was editor from 1817–43. He was on terms of intimacy with James Mill, who said of him that «he was the first journalist who carried criticism and the spirit of reform into the details of English institutions»; and was a useful ally and a congenial companion to Lord Melbourne. He had an eye for budding talent, which he liked to encourage, and it was under him that Charles Dickens began his career as a reporter for the *Chronicle.*

BLACK, John Charles, American lawyer, soldier and statesman: b. Lexington, Miss., 27 Jan. 1839; d. 17 Aug. 1915. He entered the Union army in 1861 as colonel of the 37th Illinois Volunteers; was severely wounded; and was brevetted brigadier-general. After the war he was elected Congressman-at-large from Illinois; was appointed commissioner of pensions by President Cleveland during the latter's first term, and United States attorney for the northern district of Illinois during his second term.

BLACK, Joseph, Scottish chemist: b. Bordeaux, France, 1728; d. Edinburgh, 6 Dec. 1799. He studied medicine, and in 1754 delivered a thesis, 'De Humore Acido à Cibis Orto, et Magnesia Alba,' in which he ascribes the difference between the mild and caustic alkalies to the presence of fixed air (carbonic acid) in the former. The discovery of carbonic acid is of interest not only as having preceded the other gases made by Priestley, Cavendish and others, but as having preceded in its method the explanation given by Lavoisier of the part played by oxygen in combustion. In 1756 he was appointed professor of medicine and chemistry in the University of Glasgow; and in 1766 to the same chair in Edinburgh. No teacher inspired his disciples with a greater zeal for study; his lectures therefore contributed much to make the taste for chemical science general in England. Upon Lavoisier's proposal, the Academy of Sciences in Paris appointed him one of its eight foreign members. Black did not adopt the Lavoisierian system until he was satisfied that it was more accurate than that of which he had been so long a teacher. In his later courses, however, he taught the antiphlogistic system. His 'Lectures on Chemistry' appeared in 1803.

BLACK, William, Scottish novelist: b. Glasgow, 9 Nov. 1841; d. Brighton, England, 10 Dec. 1898. He first studied art, but eventually became connected with the Glasgow press. In 1864 he went to London, and in the following year joined the staff of the *Morning Star,* for which he was special correspondent during the Austro-Prussian War of 1866. His first novel, 'James Merle' (1864), was not a success, but his 'In Silk Attire' (1869), 'Kilmeny' (1870), 'The Monarch of Mincing Lane,' and especially 'A Daughter of Heth' (1871), gained him an increasingly wide circle of readers. For four or five years he was assistant editor of the *Daily News,* but in 1874 his connection with journalism practically ceased. His other works include 'The Strange Adventures of a Phæton' (1872), containing descriptions of scenery much praised by Ruskin; 'A Princess of Thule' (1873); 'Madcap Violet' (1876); 'Green Pastures and Piccadilly' (1877); 'Macleod of Dare' (1878); 'White Wings' (1880); 'The Beautiful Wretch' (1881); 'Judith Shakespeare' (1884); 'White Heather' (1885); 'The Strange Adventures of a House-Boat' (1888); 'In Far Lochaber' (1889); 'The New Prince Fortunatus' (1890); 'Highland Cousins' (1894); 'Briseis' (1896); and 'Wild Eelin' (1898). Black's novels have enjoyed much popularity, especially in the United States. His subjects are drawn from many lands, but it is in dealing with the scenery of the Scottish Highlands that he is at his best. He is especially happy in his portrayal of types of sprightly and unconventional womanhood. A collected edition of his works was issued 1872–74. See Wemyss Reid, 'William Black, Novelist' (New York 1902).

BLACK, William Murray, American military engineer: b. Lancaster, Pa., 8 Dec. 1855. A graduate of Franklin and Marshall College and of West Point, he was engaged principally in government river and harbor work, taught at West Point, and in 1898 had advanced to the grade of lieutenant-colonel and chief engineer of the United States Volunteers. After army service at Havana, in the Philippines and at the Panama Canal, he was appointed chief engineer of the Eastern Division of the United States in 1909, and when Brigadier-General William H. Bixby (q.v.) retired in 1913 succeeded as chief of the Engineer Corps.

BLACK ACTS. Acts of the Scottish Parliaments from 1424 to 1594, so called from their being printed in black-letter. The term «Black Act» is also applied to an act of George I with reference to the «Blacks,» a body of armed deerstealers and poachers, who infested Epping Forest. The act was made permanent in 1758, but was repealed in 1827 by George IV.

BLACK ART, the art or pretended art or practice of producing wonderful effects by the aid of superhuman beings or of departed spirits or the occult powers of nature, called black because proficients in it were supposed to be in league with the powers of darkness. A large proportion of magical rites are connected with the religious beliefs of those using them, their efficacy being ascribed to supernatural beings. There is, however, a non-spiritual element in magic which depends on certain imagined powers and correspondences in nature, that can be utilized in various ways. In savage countries the native magician is often sorcerer and priest, and sometimes chief of the tribe. Among the ancient Egyptians magic was worked into an elaborate system and ritual, and it was regularly practised among the Babylonians and Assyrians, as well as in Greece and Rome. Alexandria, from the 2d to the 4th century, became the headquarters of theurgic magic, in which invocations, sacrifices, diagrams, talismans, etc., were systematically employed. This system, influenced by Jewish magical speculation, had a strong hold in mediæval Europe, and many distinguished names are found among its students and professors. The magic which still holds a place among the illiterate and ignorant classes has come down by tradition in popular folk-lore. The name «natural magic» has been given to the art of applying natural causes to produce surprising effects. It includes the art of performing tricks and exhibiting illusions by means of apparatus, the performances of automaton figures, etc. See ALCHEMY; ASTROLOGY; CHARM; DIVINATION; LEGERDEMAIN; WITCHCRAFT.

BLACK ASH, a mixture of 25 per cent of caustic soda with calcium sulphide, quicklime and unburnt coal, obtained in the process of making sodium carbonate. The mixture of sodium sulphate, chalk and powdered coal is fused in a furnace, gases escape and the residue is the black ash, which is lixiviated with warm water, and the solution, evaporated to dryness, yields soda ash, an impure sodium carbonate. See SODIUM.

BLACK ASSIZE, a judicial sitting of the courts held at Oxford in 1577, and rendered historical by the pestilential and deadly fever which was introduced into the court from the jail, and swept away judges, jurymen and counsel and extended itself into the town and neighborhood. The superstitions of the age invested it with a special character, and it was remarked that no women nor poor people died of it. Consult Holinshed, ‘Chronicles’ (London 1577 and 1807–08); Stow, ‘Annales’ (London 1580, 1631); Wood, ‘Athenæ Oxonienses’ (London 1691–92, Oxford 1848).

BLACK BASS, Duck, etc. See BASS; DUCK.

BLACK BEAUTY, His Grooms and Companions, a story by Anna Sewall. It is written in the form of a horse autobiography, and is really a tract on the proper treatment of horses. The story is told with simplicity and restraint, and its vogue has been great and its influence very wide.

BLACK BEAVER, Delaware Indian leader, trader, guide and scout: b. near Belleville, Ill., in 1806; d. near Andarko, Okla., 8 May 1880. In his young manhood he spent several years in the Rocky Mountain fur trade as a hunter and trapper. He was present as an interpreter at the council held with the Comanche, Kiowa and Wichita tribes in the Red River country by Col. Henry Dodge, in 1834, and, from that time on, until the end of his life his services were in frequent demand by the government in dealing with the Indians of the Southern Plains. During the Mexican War he raised a company of Indian scouts and guides which served with General Harney's command, and he was ever afterward known as Captain Black Beaver. He served as guide with the military escort commanded by Capt. R. B. Marcy, which accompanied the large party of emigrants and gold seekers from Fort Smith, Arkansas, to Albuquerque, N. M., en route to California in 1849. His name occurs frequently in the official reports of army officers, Indian service authorities, government surveyors and explorers. Although he belonged to the small band of Delawares which dwelt in the Red River region and far removed from the main body of the tribe, he held more or less frequent communication with the latter and appeared as one of its representatives in negotiations with the government. In 1861 he was chosen to guide the retreating Federal garrisons of Forts Smith, Washita, Arbuckle and Cobb on their march through the wilderness to Fort Leavenworth. Between 1865 and 1875 he was several times called upon to serve as a mediator and pacemaker on behalf of the government in its dealings with the turbulent Comanche and Kiowa leaders, by whom he was always regarded with confidence and respect. He claimed to have been the last custodian of a parchment copy of the treaty which had been given to the people of his tribe by William Penn at the Shakamaxon council, in 1682, and which he said was destroyed when his home on the Washita was burned by Confederate forces in 1861. In 1874–75 Black Beaver dictated the story of his life to Maj. Israel G. Vore, who wrote it down. This manuscript was accidentally destroyed in 1906. Consult ‘Handbook of American Indians,’ writings of Randolph B. Marcy; Battey's ‘A Quaker Among the Indians,’ etc.

BLACK BEETLE, the English name for a cockroach, especially the Oriental cockroach (q.v.); also less commonly for the dark-colored beetles of the bad-smelling genus *Blaps.*

BLACK-BELLIED PLOVER, or **BLACK-BREAST.** See PLOVER.

BLACK BELT, an agricultural region of Alabama, 70 miles wide extending entirely across the State, between 33° and 31° 40′; so called from the fact that the negroes greatly predominate in numbers, raising vast quantities of cotton from the richest of lands. It includes 17 counties, with over 500,000 inhabitants.

BLACK-CAP, the name of various birds having the crown of their head black. In the United States it is given most often to the common titmouse, the chickadee (q.v.); and to a small fly-catching warbler, *Sylvania pusilla*, an olive and yellow bird with the top of the head crested with black. In England the common "black-cap" (*Curruca atricapilla*) is a small warbler, closely related to the nightingale, and one of the sweetest of European songbirds and frequently kept in cages.

BLACK CAT, an American fur-bearing animal. See MARTEN.

BLACK COCKADE, a badge first worn by the American soldiers during the Revolution, and later, during the hostility toward France occasioned by the X. Y. Z. Correspondence (q.v.), adopted by the Federalists as a patriotic emblem and as a rejoinder to the tricolored cockade worn by the Republicans as a mark of affection toward France.

BLACK COHOSH. See CIMICIFUGA.

BLACK COUNTRY, name applied in England to the district between Birmingham and Wolverhampton, full of coal pits and furnaces.

BLACK DEATH, The, one of the most memorable of the epidemics of the Middle Ages, was a great pestilence in the 14th century, which devastated Asia, Europe and Africa. It was an Oriental plague, marked by inflammatory boils and tumors of the glands, such as break out in no other febrile disease. On account of these boils, and from the black spots (indicative of putrid decomposition) which appeared upon the skin, it has been generally called the Black Death. The symptoms were many, though all were not found in every case. Tumors and abscesses were found on the arms and thighs of those affected, and smaller boils on all parts of the body; black spots broke out on all parts of the skin, either single, united or confluent. Symptoms of cephalic affection were frequent; many patients became stupefied and fell into a deep sleep, losing also their speech from palsy of the tongue; others remained sleepless, without rest. The fauces and tongue were black, and as if suffused with blood. No beverage would assuage the burning thirst. The plague spread very rapidly as it was communicated from the sick to the healthy; contact with the clothes or other articles which had been used by the infected induced disease, and even the breath of the sick, who expectorated blood, caused contagion far and near. As it advanced, not only men but animals fell sick and expired. In England the plague first broke out in the county of Dorset, whence it advanced through the counties of Devon and Somerset to Bristol, and thence reached Gloucester, Oxford and London. Probably few places escaped, perhaps not any, for the annals of contemporaries report that throughout the land only a tenth part of the inhabitants remained alive. From England the contagion was carried by a ship to Norway, where the plague broke out in its most frightful form, and throughout the whole country spared not one-third of the population. The sailors found no refuge on their ships, and vessels whose crews had perished to the last man were often seen drifting on shore. The whole period of time during which the Black Death raged with destructive violence in Europe was (with the exception of Russia, where it did not break out until 1351) from 1347 to 1350; from this latter date to 1383 there were various pestilences, bad enough, indeed, but not as violent as the Black Death. Ireland was much less heavily visited than England, and the disease seems scarcely to have reached the mountainous regions of that land; and Scotland, too, would perhaps have remained free from it had not the Scotch availed themselves of the discomfiture of the English to make an irruption into England, which terminated in the destruction of their army by the plague and the sword and the extension of the pestilence, through those who escaped, over the whole country. It may be assumed that Europe lost by the Black Death some 25,000,000 of people, or about one-fourth of her entire population. That her nations could recover so quickly from this terrible loss without retrograding more than they did is a most convincing proof of the indestructibility of human society as a whole. In Hungary, and afterward in Germany, rose the brotherhood of the Flagellants, who undertook to expiate the sins of the people and avert the pestilence by self-imposed sufferings. While the wanderings of the Flagellants threw society into confusion and helped to spread the plague, the horrors of the time were further heightened by the fearful persecutions to which the Jews were subjected, from a popular belief that the pestilence was owing to their poisoning the public wells. The people rose to exterminate the Hebrew race, of whom, in Mayence alone, 12,000 were cruelly murdered. They were killed by fire and by torture wherever they could be found, and for them to the terrors of the plague were added those of a populace everywhere infuriated against them. In some places the Jewish people immolated themselves in masses; in others, not a soul of them survived the assaults of their enemies. No adequate notion can be conveyed of these horrors. To aggravate the pestilence, the poison-panic made the people shut up their wells. With terror of poison and of plague in a state of society rude at the best, but now disorganized, whatever means were available to mitigate or prevent the sufferings of the people were rendered altogether nugatory.

BLACK DUCK. See DUSKY DUCK.

BLACK EARTH, a deposit in South Russia, extending over the steppes that border on the Black Sea and the depressed area to the north of the Caspian, with a breadth from north to south of from 200 or 300 to nearly 700 miles. It varies in color from dark brown to black, and in thickness from a foot or two up to six or seven yards, occasionally reaching, it is said, even to 60 feet. It is composed chiefly of siliceous sand (about 70 per cent), alumina and other ingredients (23 per cent), and organic matter (about 7 per cent). It appears to be unfossiliferous. It bears the same relation to the glacial accumulations of Russia that the loess of the Rhine, the Danube, etc., does to those of central Europe, and is probably the fine-grained silt derived from the torrents and flooded rivers that escaped from the melting snows and glaciers of the glacial period. According to some geologists, however, it may owe its origin to the action of the wind. It is supposed by them to be simply an accumulation of wind-blown dust — the finely sifted material being fixed by the abundant grasses of those steppe regions.

BLACK-EYED SUSAN, the name of a once popular comedy by Douglas Jerrold. It appeared in 1829 and was founded on Gay's ballad 'Sweet William's Farewell to Black-Eyed Susan.'

BLACK FISH, a species of the genus *Dallia* (q.v.), *D. pectoralis*, which abounds in Sphagnum ponds, feeding on plants and worms, and forming the chief food of the natives of some parts of northern Alaska, where, with the exception of the Salmonids, it is the only fresh-water fish. Turner, its discoverer, says its vitality is extraordinary; that black-fishes will remain frozen in baskets for weeks, and when thawed are as lively as ever.

BLACK FLAGS, an organization of Chinese rebels who established themselves in the Red River Valley in Tonquin, after the suppression of the Taiping Rebellion in southern China (1850–54). From their warlike character and desperate deeds they were called Black Flags as distinguished from the peaceable Yellow Flags. They assisted the Tonquinese and Chinese in opposing the French wars (1873, 1882 and 1885), with signal results. Their principal object was plunder. They were responsible for the appalling massacre, in 1884, of French missionaries and native Christians, to the number of 10,000. The chief of the organization, Luh Vinh Phuoc, was rewarded for his services by the Chinese government.

The black flag was formerly the emblem of piracy, bearing a skull and cross-bones. Tamerlane displayed a black flag when a besieged city refused to surrender, to signify that no mercy would be shown, and that the place would be utterly destroyed. In Great Britain it is customary to hoist a black flag over a prison immediately after an execution within its walls.

BLACK FLY, a gnat of the species of the genus *Simulium*, the common black fly of northern New England, Canada and Labrador probably being *S. molestum*. In this tormenter of travelers and fishermen the body is short and thick, the labrum is free, sharp as a dagger, and the proboscis is well developed and draws blood profusely. It is black, with a broad silvery ring on the legs. The species are numerous.

The cylindrical larva is furnished with short antennæ, and near the mouth are two flabelliform appendages. The pupa has eight very long lateral filaments on the front of the thorax, and the posterior end of the body is enclosed in a semi-oval membranous cocoon, open in front, and posteriorly attached to some submerged plant such as eel-grass. The fly leaves the pupa beneath the water. She deposits her eggs on the rocks in a compact layer a few inches above the surface of the water. The eggs of the Hungarian or «Columbacz midge» are enveloped in a yellowish-white slime and deposited at the end of May or early in June upon stones or grass over which water flows, or in the brooks of the more elevated regions. The number laid is variously estimated at from 500 to 5,000. The food of the larva of the buffalo-gnat has been proved to be carnivorous, and it is supposed that the larvæ of all the species live on animal matter, though possibly in some cases on dead leaves. On hatching the larvæ become attached to plants, etc., or to each other, by a silken thread, forming long floating strings. When the fly issues from the submerged pupa-case she rises to the surface, then being protected by a fine silky covering of hairs. The adult fly in central New York issues about the first of April, and those apparently of a new brood the first of June; after this there is a succession of generations throughout the season; the development of a single brood occupying about two months. The larva hibernates.

While the black fly of Maine, and presumably of Labrador, is of the species *S. molestum*, that of the Saint Lawrence Valley has been named *S. invenustum*, and is said to be different from that of Lake Superior. A remarkably large species is known as *S. pictipes*; its larvæ and pupæ were found in the rapids of the Au Sable River, and also similar ones on the north shore of Lake Superior.

The black fly is mostly active in the bright sunlight, generally disappearing on cloudy days, but it is known to crawl under one's clothes and to bite in the night. The bite is often severe, the creature leaving a large clot of blood behind it. The best preventive is oil of tar, and the use of various ointments. Consult Bulletin No. 10, Division of Entomology, United States Department of Agriculture (Washington 1898).

BLACK FOREST (German, *Schwarzwald*), a chain of mountains in the component states of Baden and Württemberg, It is 1,844 square miles in extent, runs almost parallel with the Rhine from south to north, often only from 15 to 20 miles distant; is about 85 miles long, and from east to west in the southern part about 30 miles wide; in the northern about 18. The Danube, as well as many other rivers, rises in these mountains. Those on the west side run into the Rhine; those on the east side into the Danube. The Black Forest is rather a chain of elevated plains than of isolated peaks. The highest summit, the Feldberg, measures 4,900 English feet. Except from June to September, these mountains are generally covered with snow, and even during this period are not entirely free from it. Among the many valleys of this chain, the Murgthal is particularly celebrated for its beautiful scenery. The whole chain consists of primitive mountains: its skeleton throughout is granite; its higher points are covered with sandstone and other layers of less consequence. On the western side, at the foot, appears gneiss. Porphyry and clay-slate are found on several heights, as likewise silver, lead, copper, iron, cobalt and other minerals. The forests are extensive, and consist mostly of pines and similar species. The raising of cattle is the principal branch of husbandry carried on in this district. The soil is not fertile, and the inhabitants scattered over the mountains live very frugally, and are very industrious. The vast quantity of timber growing here has long been a considerable source of revenue. The timber of the Black Forest was always highly prized by the Dutch, and the export to Holland is still largely carried on, the trees being conveyed down the Rhine in the form of rafts. Many saw-mills are kept at work cutting up the timber; and the forests also give employment to charcoal-burners, potash-boilers, etc. The manufacture of the well-known wooden clocks, toys, etc., is another important branch of industry, in which many persons are employed. Watches are also made, as well as orchestrions and other musical instruments. Neustadt, Freiberg, Hornberg and Furtwangen are central points of the manufacture of wooden wares, the commerce in which embraces all Europe, and extends to America and Australia. The Black Forest has long been in favor as a tourist resort and tramping ground, and it is famous as the scene of many legends and folk tales.

BLACK FRIARS, friars of the Dominican order: so called from the color of their habit. See Dominicans; Religious Orders.

BLACK FRIDAY, the name given in the United States to two days that ushered in financial panics. First, Friday, 24 Sept. 1869, when the attempt of Jay Gould and James Fisk, Jr., to create a corner in the gold market by buying all the gold in the banks of New York city, amounting to $15,000,000, culminated. For several days the value of gold had risen steadily, and the speculators aimed to carry it from 144 to 200. Friday, the whole city was in a ferment, the banks were rapidly selling, gold was at 162½, and still rising. Men became insane, and everywhere the wildest excitement raged, for it seemed probable that the business houses must be closed, from ignorance of the prices to be charged for their goods. But in the midst of the panic it was reported that Secretary Boutwell of the United States Treasury had thrown $4,000,000 on the market, and at once gold fell, the excitement ceased, leaving Gould and Fisk the winners of $11,000,000. The second was 19 Sept. 1873, when numerous failures on the New York Stock Exchange precipitated the panic of 1873.

The term was first used in England, being applied in the first instance to the Friday on which the news reached London, 6 Dec. 1745, that the young pretender, Charles Edward, had arrived at Derby, creating a terrible panic; and finally to 11 May 1866, when the failure of Overend, Gurney & Company, London, the day before, was followed by a widespread financial ruin. Good Friday is also known as Black Friday in some countries, because of the use of black vestments and draperies in the churches. Consult *The Yale Review* (Vol. III, New Haven 1896); Andrews, ‘The United States in Our Own Time’ (New York 1903); and Julgar's ‘Short History of Panics’ (New York 1893).

BLACK GUM, SOUR GUM, or **PEPPERIDGE.** See Tupelo.

BLACK HAWK, chief of the Sac Indians: b. Kaskaskia, Ill., 1767; d. near Fort Des Moines, 3 Oct. 1838. He was made chief of the Sacs in 1788; and in 1804 repudiated the first agreement made by the Sacs and the Foxes with the United States to give up their lands east of the Mississippi. The possession of the territory was disputed for a number of years; in 1823 the majority of the two tribes moved across the river, and a treaty with the United States, ceding the disputed territory, was signed in 1830. Black Hawk, however, objected to the whites occupying the vacated territory, and in June 1831 he began the Black Hawk War by crossing the Mississippi with a small force and attacked some Illinois villages. Driven off by the militia under General Gaines, he returned in the spring of 1832 with a larger force and began to massacre the white settlers. The Indians were however defeated by United States troops in two battles near the Wisconsin River, 21 July 1832, and near the Bad-Axe River, 1-2 Aug. 1832. The war was brought to an end by the surrender of Black Hawk in the latter part of August. He was kept a prisoner till 1833, then rejoined his tribe on their reservation, near Fort Des Moines. Consult Drake, ‘Life of Black Hawk’; Patterson, ‘Life of Black Hawk’ (Boston 1834); Snelling, ‘Life of Black Hawk’; Thwaites, ‘Story of the Black Hawk War’ (Wisconsin Historical Society ‘Papers,’ Vol. XII); Stevens, F. E., ‘The Black Hawk War’ (Chicago 1903); Wakefield, ‘History of the Black Hawk War’ (edited by F. E. Stevens for the Caxton Club, Chicago 1908).

BLACK HAWK WAR. See Black Hawk.

BLACK HILLS. A small group of mountains known as the Black Hills rises several thousand feet above the plains in western South Dakota and eastern Wyoming. Having abundant rainfall it constitutes through its vegetation and streams an oasis in the semi-arid region. The hills are carved from a dome-shaped uplift of the earth's crust and consist largely of rocks that are older than those forming the surface of the Great Plains. In these older rocks are extensive mineral deposits, which give the region great importance in the production of precious metals. The length of the Black Hills is about 100 miles and the greatest width about 50 miles. The hills rise abruptly from the plains to an elevation of about 4,000 feet. Of its total area of 6,000 square miles 1,900 square miles are now a United States forest reserve. The salient features are an encircling «hogback» ridge, constituting the outer rim of the hills, the Red Valley, which extends completely around the uplift, then a limestone plateau with infacing escarpment, and finally a central area of high ridges culminating in the precipitous crags of Harney Peak at an altitude of 7,242 feet. Two branches of Cheyenne River nearly surround the hills and receive from them many tributaries of running water, notably Spearfish, Rapid, Redwater and Beaver creeks. The rocks exposed comprise sandstones and shales of Cretaceous Age, red shales of Permian and possibly Triassiac Age, limestones and sandstones of Carboniferous, Ordovician and late Cambrian Age with a central nucleus of Algonkian granite and schist. In the latter are veins of gold ore, which have been extensively mined for many years. The largest mine is the Homestake, at Lead, which produces from $6,000,000 to $6,500,000 in gold a year. Other mines yield smaller amounts of gold and considerable lead, silver, lithia minerals, mica and wolframite are also produced. In the northern hills are many bodies of igneous rocks and on the northwest slope is Devil's Tower. The largest cities in the Black Hills are Lead, largely sustained by the Homestake and other mines, and Deadwood, on the site of part of the great free gold placers, the cause of the memorable stampede to the Black Hills, 1876–78.

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BLACK HOLE, in 18th-century Calcutta, the soldiers' name for the dungeon in the East India Company's citadel, Fort William: 18×14 5/6 feet, with two heavily barred windows and a low veranda outside; almost airless and meant only for two or three men. The Subahdar of Bengal stormed the fort 20 June 1756, and believing it to hold vast hidden treasures, twice ordered the commandant, J. Z. Holwell, to disclose them; failing, he desisted till morning, but ordered all the company's servants kept secure and obviously alive — outsiders knew no secrets and were not mentioned. The amazing sequel is Holwell's story, all others being derived from or simple echoes of his: The Subahdar's guards drove and locked all the white inmates, non-combatants and all (later Holwell included a woman), numbering 146, into this cell till morning, knowing all would probably die and their secret with them; and refused heavy bribes to ask their master for a larger room, in fear of waking him! Packed standing, with 1 5/6 square feet per man, no new air, and fires in the fort making it worse, despite stripping themselves the flood of sweat soon began to madden them with thirst, and death came fast. Water brought by a guard and passed in hats was mostly spilled, and the rest of little service. Suffocation and terror broke all restraints: the prisoners fought for places at the windows, and many were crushed or trampled out of life. By 11 one-third were dead; at 6 A.M., when the Subahdar called for them, only 23, including Holwell, were alive. The potentate expressed neither concern for the tragedy, nor anger at the defiance of orders that might have robbed him of the treasure; but Holwell graciously acquits him of intending it, and later thought the guards revengeful for their losses in the storm. He and three others were sent prisoners to Muxadavad, the rest set free, and the corpses thrown into a ditch, now commemorated by an obelisk 50 feet high. The cell is now a storeroom. The story is suspicious on its face; Holwell was given to lying and had motives for it here; his details are rife with contradictions and impossibilities, and at least much decorated; and a Calcutta Englishman, J. H. Little, supported by scholarly Hindus, has lately denounced the whole story as a fiction. On his theory the Black Hole incident really occurred, but comprised only the company's officers, nine in all, two already wounded, who died with one other; the guards therefore did not defy a master they so dreaded; his promise of sparing the prisoners' lives was fairly kept, and the other 114 dead lost theirs in defending the fort, and should be commemorated as heroes, not as spiritless victims of a cowardly massacre. The facts that the company's council never sent home any account of the tragedy, that Clive and his army never attempted to revenge it and seem not to have known it till long after, and many other like fact, all cohere with these. On the other hand, the difficulties of admitting it are nearly as cogent and in some ways unanswerable, and judgment as yet must be held in suspense. Consult the Calcutta Historical Society's magazine, *Bengal, Past and Present,* July–September 1915 and January–March 1916.

BLACK HORSE CAVALRY, a term applied to a coterie of Republican members of the legislature of New York State who were accused of selling legislative privileges and of extorting money from corporations either by threats to introduce or the actual introduction of blackmailing legislation. The investigation of the conduct of Senator Allds in 1910 brought to light many disagreeable methods employed by these members.

BLACK JACK. (1) A term loosely applied by miners to blende, the sulphuret of zinc, or to any other ore which resembles it in being obnoxious to them, if in no other respect. (2) One of several small oak trees of the southeastern coast, especially *Quercus Marylandica,* which has a rough, dark, scaly bark and peculiar, broadly wedged-shaped, 3–5 lobed leaves, dark green and lustrous above, and somewhat rusty beneath. (3) The name given to a capacious drinking can or cup made of waxed leather or thin metal, the outside of which is japanned black.

BLACK KETTLE, a leading chief of the Cheyenne tribe of Indians: b. near the Black Hills of Dakota about 1803; d. 27 Nov. 1868. In the separation of his people into the Northern and Southern Cheyenne tribes, about 1832, he cast his lot with the latter. His name did not appear among the signers of the treaty in which the Southern Cheyenne tribe joined at the Horse Creek council on the Platte, in 1851, but it did appear as that of the ranking chief of the tribe on the treaty which was negotiated at Fort Wise, Col., in 1861. In September 1864, he visited Denver at the head of a delegation of Cheyenne and Arapaho chiefs (their people having been at war with the whites during the summer) to ask for peace at the hands of Gov. John Evans, who was also superintendent of Indian affairs for Colorado Territory. This request having been refused, Black Kettle and several of the other leaders took a large band of their people to Fort Lyon, Col., where they surrendered to the commander, Maj. Edward W. Wynkoop, giving up their horses and arms as an earnest of their sincerity. Major Wynkoop was relieved of his command of the post a few weeks later and his successor, returning the surrendered arms and horses to Black Kettle and his people, directed them to move their camp to a point on Sand Creek, 40 miles distant, where they could subsist by hunting. Trusting implicitly in the good faith and integrity of the military authorities, Black Kettle and his followers did as they were told, whereupon an expedition was organized at Denver under the command of Col. John M. Chivington, marched to Sand Creek and attacked the Cheyenne camp, killing 161 of its people, regardless of age or sex, 29 Nov. 1864. Despite the evident treachery with which this massacre had been planned and executed, Black Kettle remained inclined toward peace, maintaining his friendship with Major Wynkoop, former Agent William Bent and other white men whom he could trust and who aided in negotiating a new treaty in the council held at the mouth of the Little Arkansas, in October 1865, whereby the Sand Creek massacre was specifically disavowed by the government of the

United States and material reparation offered therefor. In the winter of 1866–67, Black Kettle visited Fort Harker, Kan., where he made an eloquent though ineffective plea against the extension of the «iron road» across the plains, contending that it «would drive away the buffalo and leave the red children of the Great Father at Washington to starve.» He signed the treaty which was entered into at Medicine Lodge in October 1867, but a large part of his own tribe, resenting the building of the railways across the buffalo range and the increasing encroachments of white hunters, continued at war the following year. Black Kettle, however, remained peaceably near the tribal agency at Fort Larned. In the autumn, against the advice of Agent Wynkoop, he removed the encampment of his band to the valley of the Washita, in the extreme western part of the Indian Territory, whence he made a journey to Fort Cobb to assure the commandant, Gen. William B. Hazen, of his friendliness. A few days after his return from Fort Cobb, his village was attacked and destroyed by the 7th U. S. Cavalry, under command of Gen. George A. Custer, Black Kettle being among the slain, 27 Nov. 1868. Consult 'Annual Report of the Commissioner of Indian Affairs' (Washington, D. C., 1864, pp. 216–58); also, «Massacre of the Cheyenne Indians» (a special report of the Committee on the Conduct of the War, House of Representatives, 10 Jan. 1865).

BLACK KNIGHT, The, a name given by romantic writers to various heroic characters. In Scott's 'Ivanhoe' Richard Cœur de Lion masquerades as the Black Knight. The Knight Esplandian, son of Amadis of Gaul and Oriana, is also so called. In the Arthurian legend the Black Knight, Sir Peread, was one of the four brothers who kept the passage of Castle Dangerous.

BLACK LAW, in the United States the name given to certain laws in force before the Civil War in many of the Northern and border States discriminating against free negroes who might become citizens. Such laws excluded negroes from the public schools and from the militia, forbade them to testify in court against a white man or in any case in which a white man was interested. Consult Wilson, 'Rise and Fall of the Slave Power in America.'

BLACK LETTER, that variety of type otherwise designated Gothic or Old English, and which in a modified form is the ordinary type made use of in Germany, although in recent years there has been a tendency to employ the Roman letter, the Gothic type being considered injurious to the eyes. It was introduced into England during the 14th century and is the character generally used in the manuscripts and first printed books. See PRINTING.

BLACK LILLY. See FRITILLARY.

BLACK LIST. See BLACKLIST, THE; BLACKLISTING.

BLACK MARIA, in American and English slang, the prison van in which delinquents are conveyed between court and prison. The term is supposed to have originated in Philadelphia in 1838; another tradition ascribes it to a powerful negress who kept a sailors' boarding-house in Boston. She frequently assisted the police in handling violent cases. Her name was Maria Lee. In French a mud-barge is called «Marie-salope»— slovenly Maria.

BLACK MONDAY. (1) A name for Easter Monday, in remembrance of the dreadful experiences of the army of Edward III, before Paris, on Easter Monday, 14 April 1360. Many soldiers and horses perished from the extreme cold. Also in 1351, there was a tremendous hailstorm on Easter Monday in which many perished. (2) The 27th of February, 1865, a memorable day in Melbourne, Australia, when a destructive sirocco prevailed in the surrounding country.

BLACK MOUNTAINS, the culminating group of the Appalachian system, named from the dark growth of balsam-firs and other evergreens which cover their summits. Their position is in Yancey and Buncombe counties, N. C., between the main central ridges on the west and a portion of the Blue Ridge on the east. Unlike the other ridges of the Alleghanies, they lie for the most part transverse to the general trend of the range, and give this direction to the great valleys and rivers included between them. They rise from a district of great elevation, the height of the valley at Asheville, on the French Broad River, being about 2,000 feet above the sea, and that of Toe River, at Burnsville, Yancey County, about 2,500 feet. From this plateau the drainage is toward the Ohio in a northerly direction by the branches of the Great Kanawha, by those of the Holston and the French Broad toward the southwest, and by those of the Yadkin and the Catawba into the Pedee and Santee toward the southeast. This position at the sources of streams flowing in such diverse directions long since pointed out this district as probably the most elevated east of the Rocky Mountains. The chief peaks are Mitchell, 6,710, and Clingman's Peak, Guyot's Peak, or Balsam Cone, Sandoz Knob, Hairy Bear, Cat Tail Peak, Gibbe's Peak, Sugar Loaf, or Hallback Peak, Potato Top, Black Knob, Bowler's Pyramid, Roan Mountain, all of which are above 6,500 feet in height.

BLACK PRINCE (EDWARD, PRINCE OF WALES), the son of Edward III of England. He is thus styled in history by reason of the color of his armor. He died in 1376 and his son became king in 1377 as Richard II.

BLACK-QUARTER, an apoplectic disease which attacks cattle, indicated by lameness of the forefoot, one of the limbs swelling, and after death being suffused with black blood, which also is found throughout the body. The disease, which chiefly attacks young cattle, is due to undrained fertile pasture, or to the too rapid transference of the cattle from poorer to richer soils. It is difficult to cure, but may be prevented by thorough draining or by giving regular doses of nitre to all the animals. The usual treatment consists in blood-letting, cutting into the swollen parts, and administering first nitre and afterward ammonium acetate and purgatives. In the United States the disease is especially prevalent in Texas, Kansas, Nebraska, South Dakota and Colorado.

BLACK RIVER, the name of several American rivers. (1) A river which rises in New York in Herkimer County, and after passing through Oneida and Lewis counties, changes its course at a place called Great Bend, passes by Watertown, and flows through Black River Bay into Lake Ontario. Near Turin, in Lewis County, it has a fall of about 63 feet. Below the fall it is navigable to Carthage, a distance of 40 miles. The whole length of the river is 125 miles, and its breadth at Watertown (six miles from its mouth) is 60 yards. (2) A river of Missouri and Arkansas, also known as the Big Black River, the largest affluent of the White River. It rises in the southeastern part of the former State, takes a southerly course, enters Arkansas, and joins the White River 40 miles below Batesville. During nine months of the year it is navigable for a distance of 100 miles from its mouth. Its entire length is about 400 miles. Trout and other excellent fish are caught in its waters in great abundance. (3) A river of Wisconsin. It rises in Marathon County and enters the Mississippi 15 miles above La Crosse, after a course of 225 miles. (4) A river of Vermont which rises in the town of Plymouth and is a tributary of the Connecticut. Its abundant water power is utilized by various manufactories along its course. (5) A portion of the Washita River in Louisiana between the mouth of the Tensaw River and the Red River; also sometimes styled Black River.

BLACK RIVER FALLS, Wis., city and the county-seat of Jackson County, 171 miles northwest of Milwaukee. A fine water power is afforded by the falls of the Black River, and there are flour and lumber mills, wagon and other factories, foundries, machine shops and nurseries. There are iron mines in the neighborhood, and kaolin deposits from which firebrick is manufactured. Pop. 2,000.

BLACK ROCK DESERT, a tract of nearly 1,000 square miles, north of Pyramid Lake, in Nevada. In summer it is a barren level of alkali and in winter covered in places with shallow water. Called also «Mud Lakes.»

BLACK ROD, Gentleman Usher of the, an officer of the House of Lords, and of the Order of the Garter, appointed by letters-patent from the Crown, and employed to execute orders for the commitment of parties in the Lords guilty of breach of privilege and contempt, to assist at the introduction of peers and other ceremonies; and to summon the Commons to attend in the House of Lords when the royal assent is given to bills. His deputy is called the yeoman-usher.

BLACK ROOD OF SCOTLAND, a cross of gold in the form of a casket, believed to contain a splinter of the true Cross. It was brought to Scotland in the 11th century by Margaret, Queen of Malcolm III; and was bequeathed as a sacred relic. It was delivered to Edward I in 1291, but restored to Scotland after the Peace of Northampton in 1328. It was finally taken in battle by the English in 1346, and hung in the cathedral of Durham until the Reformation, when it disappeared.

BLACK RUBRIC, a name given in the Church of England prayerbook to the declaration asserting that by the practice of kneeling no adoration was intended to be implied toward any real or essential Presence in the Sacramental Elements, in other words, kneeling did not express any belief in transubstantiation. The declaration was printed in black-letter in the revision of 1661; it had, however, been originally inserted in the edition of 1552, only three days before the day of publication, by order of the Privy Council, and against the wishes of Archbishop Cranmer. It is believed to have been the work of Peter Martyr, instigated by the Scottish reformer, John Knox, who had preached against kneeling at the reception of communion. The «rubric» had been omitted from the edition of 1559, and replaced in that of 1661, since when it has remained in the English prayerbook. In the 1789 revision for the American Episcopal Church it was removed.

BLACK SATURDAY, 4 Aug. 1621; so called in Scotland because a violent storm occurred at the very moment the Parliament was sitting to enforce episcopacy on the people. The name was also applied to 10 Sept. 1547, on which date the disastrous battle of Pinkie was fought, when Somerset defeated the Scots.

BLACK SEA (Lat. *Pontus Euxinus*), a sea situated between Europe and Asia, and bounded on the west by Turkey, Bulgaria and Rumania, northwest, north and east by Ukrania and Transcaucasia, south by Anatolia (Asia Minor), being connected with the Mediterranean by the Bosporus, and with the Sea of Azov by the Strait of Yenikale. The area of the Black Sea and the Sea of Azov amounts to 168,500 square miles; its length is 750 miles and breadth 385 miles. The water is not so clear as that of the Mediterranean, and, on account of the many large rivers which fall into it,— the Danube, Dniester, Dnieper, Don, Kuban, etc.,— being less salt, freezes more readily. The tempests on this sea are sometimes tremendous in winter, as the land which confines its agitated waters gives to them a kind of whirling motion; but being practically clear of islands and rocks, its navigation is not difficult on the whole. Tidal action is scarcely perceptible. A strong current, however, sets toward the Bosporus, and an undercurrent in the opposite direction from the Ægean Sea. In 1854 one of its tremendous storms occasioned a very serious loss to the shipping of the allied British and French. The fisheries in the Sea of Azov and the Black Sea are not unimportant, various kinds of valuable fish both large and small being taken; among others, several species of sturgeon. Caviare is made on the coast, as well as fish-glue, fish-oil, and, from the spawn of the sea mullet, botargo. The chief ports are Odessa, Kherson, Nicolaiev, Sebastopol, Novorossisk, Batoum, Trebizond, Samsun, Sinope and Varna. It contains no islands of any note. After the capture of Constantinople (1453) the Turks excluded all but their own ships from the Black Sea till 1774, when the Russians obtained the right to trade in it, the same right being accorded to Austria in 1784, and to Britain and France in 1802. The preponderance thereafter gained by Russia was one of the causes of the Crimean War. The sea was declared neutral by the Treaty of Paris in 1856. In 1871, however, the sea was deneutralized by a conference of the European powers (France being unrepresented) at London in response to a protest from Russia. Certain modifications were made at the Congress of Berlin in 1878 and continued down to the outbreak of the War of 1914. For the military and naval operations in this theatre see WAR, EUROPEAN — CAMPAIGNS ON EASTERN FRONT AND NAVAL OPERATIONS.

BLACK AND TAN TERRIER. See TERRIER.

BLACK TIN, tin ore when dressed, stamped and washed ready for smelting, forming a black powder. See TIN.

BLACK-VOMIT, a form of vomiting occurring usually in severe cases of yellow fever, due to the presence of blood in the stomach, and which is regarded as a sign of approaching death. See YELLOW FEVER.

BLACK WAD, an ore of manganese, used in making chlorine gas and as a drying ingredient in paints. It is an earthy variety of the dioxide found in low-lying districts, and is often mixed with oxides of cobalt or copper.

BLACK WALNUT. See WALNUT.

BLACK WARRIOR, an American merchant vessel, seized and confiscated by Cuban customs officers in May 1854. This seizure was used as an excuse for proposed filibustering expeditions against Cuba. Spain, however, made compensation for the seizure.

BLACK WARRIOR, a river of Alabama, formed by the junction of the Sipsey, Locust and Mulberry forks. It flows into the Tombigbee near Demopolis, after a course of 300 miles, and is navigable in its lower course to Tuscaloosa.

BLACK WATCH, The, a famous Scottish regiment, originating as a body of Highlanders, raised about 1668, for the purpose of keeping the peace in the Highlands, and so named from their dark dress. They were incorporated at Aberfeldy in the regular army under the title of the 42d regiment in 1739. It first distinguished itself in the battle of Fontenoy (1745). From 1750 till 1767 the regiment was in America, and on its return it received the title of Royal Highlanders. It again served in America during the War of Independence. Few British regiments approach it in battle honors. Consult Barton, ‘The Black Watch’ (London 1910).

BLACK WATER STATE, a popular nickname for Nebraska.

BLACKADDER, John, Scottish preacher: b. 1615; d. January 1686. He was ordained to the parish of Troqueer in 1653. When, in 1662, the Episcopal form of church government was forced upon a people who were generally opposed to it, Blackadder employed himself in exposing what he considered its unlawfulness, and, in his own words, entered his «dissent in heaven» against it. He was obliged to demit his charge in favor of an Episcopal incumbent, was summoned before the Privy Council for preaching at conventicles and in 1674 was outlawed. In 1678 he sought refuge in Holland, returned in 1679, was afterward apprehended and confined in the state prison upon the Bass Rock, where he died. Consult Crichton, ‘Life of Blackadder’ (1823).

BLACKBERRY, various species of *Rubus* in which the drupelets adhere to the receptacle after ripening. Two general types are common: the trailing or dewberry (q.v.), and the upright, which is more generally known as the blackberry. The cultivated blackberries, developed from species of *Rubus*, native in eastern North America, consist of numerous varieties and have become in America, but not elsewhere, an important commercial fruit. They are used chiefly as a dessert fruit, but are also preserved, canned and evaporated. The plants thrive best on a northern slope and on rather heavy, loamy soils retentive of moisture but well drained. The soil must not be rich in nitrogenous food, since this tends to increase wood at the expense of fruitfulness. On light soils the plants are likely to suffer from lack of moisture in dry seasons. Potash fertilizers are required in abundance. Plants are usually propagated from root cuttings or suckers, and when one season old the smaller varieties are set in the field usually three by eight feet apart, the larger four by ten or else in checks six by six feet or more. When set in checks cultivation may be given both ways. For cultivation, diseases, etc., see RASPBERRY. In Europe the bramble (*R. fruticosus*) is called the blackberry. It is not extensively cultivated. Consult Bailey, ‘Standard Cyclopedia of Horticulture’ (1914); Card, ‘Bush Fruits’ (1901).

BLACKBERRY LILY (LEOPARD FLOWER) (*Gemmingia chinensis*), a perennial herb of the family *Iridaceæ*, native of Japan and China and long cultivated as a garden plant for its orange, red-spotted flowers. Its popular names were suggested by the blackberry-like clusters of roundish seeds and the spotted flowers. The fruiting heads are occasionally used for decoration with dried grass. The seeds may be sown in a sunny place where the soil is light and rich, and in after years the rootstocks may be divided.

BLACKBIRD, the name given to two distinct species of birds: (1) The American grakles (q.v.) of the family *Icteridæ*, which consists of about a dozen species differing in size and color. (2) The English song-thrush or «merle.» Four species are known in the Eastern States, namely: the purple grakle, and rusty grakle, the red-winged blackbird and the cow-bird.

The most familiar American one is the crow-blackbird, more properly termed purple-grakle, because of the iridescent or metallic gloss on its plumage. This bird is found throughout the entire East, and as far west as Dakota. It is the largest variety, being 12 inches in length. In the spring flocks of these grakles are found among the advance guard of the returning hosts of the homeward-bound migrants, although many remain in the Southern States throughout the entire winter season. Their nests, located along the edges of the swamps, are rude, strong structures of sticks and reeds, placed among the branches of bushes, in the tops of tall pine trees or in holes of old tree-stumps. The eggs are remarkably varied in size, shape and color, some being pointed, others long and slender, while others are nearly globular, the length averaging about 1.25 by .90 of an inch. The color is any shade of dirty white, light-blue or green, and the markings consist of confused blotches, scratches and straggling lines of various dark tints. A bird similar in its habits and mode of life to the purple-grakle is the rusty blackbird, lacking only the metallic hues, its plumage being rusty black. The marshes where they breed are great centres of blackbird population, and they collect in great flocks of young and old as the end of the season approaches. At this time they visit any neighboring fields of Indian corn, sometimes in hordes, to tear open the husks, feed upon the milky kernels and make themselves obnoxious to the farmers, although, indisputably, they are, on the whole, beneficial by their destruction of insects. The red-winged blackbird (*Agelæus phœniceus*), a variety of which is also found on the Pacific coast, varies in color from the bird of the Eastern States, in the fact that it has on the wing a dark, blood-red patch, bordered with pure white, the other possessing only the scarlet patches on each shoulder, from which it takes its name. The nests of the red-winged blackbird are placed near the ground, among reeds or in small bushes and swamps. The eggs are smaller and lighter in color than those of the grakle, but resemble them in the scrawled markings. The French-Canadians call them «officer-birds.« The impression upon the beholder, as he gazes at the prodigious flocks of tens of thousands of these red-epauleted blackbirds, when gathered upon the marshes preparing for the fall migrations, and wheeling in regular lines as they fly, their epaulets glistening in the sun, is that of an army of soldiers. Besides these, there is found in the Middle West the handsomest of the family, the yellow-headed blackbird (*Xanthocephalus xanthocephalus*), in which the whole head and throat are rich orange-yellow. The females of many species are strikingly contrasted in plumage to their mates, having only a streaked brown dress instead of glossy black and red or yellow of the males. The young resemble the females in their protected dullness of plumage. For the English blackbird, see SONG THRUSH. For the cow-bird, see COW-BIRD.

The name is given to various other birds, prevailing black in plumage, as, for example, to the bobolink (q.v.) which is called «skunk blackbird,» because of the resemblance in its black and white markings to those of a skunk, and to the ani of Florida and the West Indies, which is commonly termed «savanna blackbird.» Consult Baird, Brunner and Ridgeway, ‹North American Birds› (Boston 1874); Ingersoll, ‹Wild Life of Orchard and Field› (1902).

BLACKBREAST, a local name among American sportsmen for (1) the black-bellied plover (*Charadrius squatarola*); (2) the dunlin (*Tringa alpina*), also called «blackheart.»

BLACKBUCK, the common small antelope (*Antilope cervicapra*), of the plains of India and Assam. This is the typical antelope, with horns from 16 to 20 inches long, rising in an elegant spiral from the top of the head. The body is blackish brown above, sharply contrasted with white on the under parts, and with a conspicuous white ring around each eye. The doe is smaller in size. These handsome little antelopes go about ordinarily in family parties, but sometimes gather in large herds, and are a favorite object of sport in India, where they are usually chased on horseback with greyhounds — sometimes also with the cheeta (q.v.) or by the aid of falcons. They are so swift that the best of dogs are required to catch them. They continue numerous because they are never hunted by the native Hindus, on account of religious prejudices. The name is also applied to the African sable antelope. Consult Baker, ‹Wild Beasts and Their Ways,› and other writers upon the sport and natural history of India.

BLACKBURN, Joseph Clay Styles, American lawyer and statesman: b. Woodford County, Ky., 1 Oct. 1838; was graduated at Center College, Danville, Ky., in 1857; admitted to the bar of Kentucky in 1858, and practised law in Chicago until 1860. During the Civil War he served in the Confederate army, and after the war resumed practice in Arkansas, and in 1868 returned to Kentucky. In 1871 and 1873 he was elected to the Kentucky legislature, and in 1874 to Congress, serving five terms in the House of Representatives; served in the United States Senate 1885–97, and was again elected for the term 1901–07, being elected chairman of the Democratic caucus of the Senate, which office carried with it the leadership of the Democratic party in the Senate. He was a leader of the silver wing of the Democratic party, and took a conspicuous part in the fight for free silver in the National Democratic Convention of 1896, when his name was presented by the Kentucky delegation as its choice for President. In 1907 was appointed a member of the Isthmian Canal Commission and was designated civil governor of the Canal Zone. Resigned in 1909. On 7 Feb. 1914 he was appointed by act of Congress the special resident commissioner of the construction of the Lincoln Memorial at Washington.

BLACKBURN, Luke Pryor, American physician: b. Woodford County, Ky., 16 June 1816; d. 14 Sept. 1887; was graduated at Transylvania University, Lexington, Ky., in 1834; began practising in the town of Versailles and gave his services free during the great epidemic. In 1846 he went to Natchez, Miss., and in 1848, when yellow fever appeared in New Orleans, he established the first quarantine against New Orleans that had ever been known in the Mississippi Valley. During the Civil War he was a surgeon on the staff of General Price. In 1875, when yellow fever broke out in Memphis, he hastened to the city and organized a corps of physicians and nurses, and in 1878 gave his services to the yellow fever sufferers at Hickman, Ky. He was elected governor of Kentucky in 1879, and as such is remembered for his prison reforms. He founded the Blackburn Sanitarium for Nervous and Mental Diseases in 1884.

BLACKBURN, William Maxwell, American Presbyterian clergyman and educator: b. Carlisle, Ind., 30 Dec. 1828; d. 1900. He became president of the Territorial University of North Dakota in 1884, and of Pierre University, South Dakota, in 1886 (now Huron College). He wrote ‹Admiral Coligny and the Rise of the Huguenots›; ‹Ulrich Zwingli, the Patriotic Reformer›; ‹Historical Sketch of North and South Dakota,› and the ‹Uncle Alick› series of juvenile stories.

BLACKBURN, England, municipal, parliamentary and county borough in Lancashire, 24 miles north-northwest from Manchester. There is a free grammar school, founded by Queen Elizabeth in 1557; a free school for girls founded by William Leyland in 1765, and a technical school. The town-hall and other public buildings, including the library, museum, Gothic Exchange and Drapers' Hall, are all modern and handsome buildings. There are two public parks, one beautifully situated on the declivity of Revidge Hill. The railways all converge and pass through one large railway station belonging to the Lancashire and Y. Railway Company. The Leeds and Liverpool Canal gives valuable connections. The corporation owns all the public utilities. Blackburn is one of the chief seats of the cotton manufacture, there being upward of 140 mills, as well as works for making cotton machinery and steam-engines. Blackburn is believed to have been the birthplace of James Hargreaves, who invented the spinning jenny in the neighborhood in 1764; but the operatives, fearful for their employment, would have none of it, and a mob destroyed (1768) both his jenny and his loom. Lord Morley of Blackburn is another distinguished native. Pop. 133,052.

BLACKBURNE, Francis, Irish jurist: b. 1782; d. 1867. He was educated at Trinity College, Dublin; called to the English bar in 1805 and to the Irish bar in 1822. He was attorney-general for Ireland in 1830 and 1841; master of the rolls, 1842; chief justice of the Court of Queen's Bench, 1846, and lord chancellor, 1852, 1866. He is remembered as having prosecuted Daniel O'Connell and as presiding at the trial of Smith O'Brien.

BLACKBURNE, Joseph Henry, British chess champion: b. Manchester 1842. He was first a draughts player, and after taking up chess became a proficient in what is known as «blindfold» play. He began taking part in tournaments in the late 60's, and thereafter competed in most of the outstanding matches with almost phenomenal success.

BLACKCOCK, or **HEATHCOCK,** a large European grouse (*Tetrao tetrix*), so called because of the glossy black color of the cock; also known as blackgrouse. The female is grayish, mottled in darker colors, and is called «grayhen,» or «heathhen›; the young are called «poults.» See Capercaillie.

BLACKFEET INDIANS, an important Algonquin confederacy of the northern plains, inhabiting, until within recent historical times, the territory from the headstreams of the Missouri in Montana to North Saskatchewan, now in the provinces of Saskatchewan and Alberta, and from long. 105° to the base of the Rocky Mountains. They are now settled on reserves, three in Alberta and one in northwest Montana. The origin of the name is disputed, but it is believed to have reference to the discoloration of their moccasins by the prairie fires. They consist of three subtribes, the Siksika proper or Blackfeet, the Kainah or Bloods and the Piegan — the whole being known as Bloods, and in close alliance with the Atsina and Sarsi. They were ~~roving~~ buffalo hunters, warlike, without permanent habitations, having no arts and no agriculture, except the growing of some tobacco. They have a great number of secret societies and many tribal dances; their dead were deposited in trees or laid on tepis erected on prominent hills. Mackenzie estimated their numbers in 1790 at 9,000; they have been repeatedly decimated by smallpox; the sudden extinction of the buffalo in 1879 threatened disastrous results for them, but was met by prompt State action. Numbers (1911) 2,337 in Alberta, 2,195 in Montana.

BLACKFIN. See Bluefin.

BLACKFISH, any one of a variety of dark-colored fishes, both of America and Europe. For the American «blackfish,» see Tautog, Seabass and Minnow. The English «blackfish» is a kind of mackerel (*Centrolophus niger*), about two feet long. It occurs rather abundantly off the south coast of Europe, and is much esteemed as a food fish.

The name is also given to a small «killer» whale of the genus *Globicephalus*, which goes about in shoals that often enter harbors. They are sought by fishermen for the sake of a small amount of oil, resembling sperm-oil, to be obtained from their fat, and also for the sake of their beef-like flesh. The common blackfish of the Atlantic is *G. brachypterus*, and that of the north Pacific *G. scammoni*. Sailors give the name «blackfish» to the «caaing,» or «pilot» whale, and to the various other small cetaceans. Consult Bullen, ‘Cruise of the Cachalot’; Scammon, ‘Marine Mammals of North America.’

BLACKGUARD, a term used in the 16th century for the lowest menials of a noble house, the scullions who cleaned pots and pans. It was also used of the hangers-on of an army, camp followers, then of a rabble, and of vagabonds in general.

BLACKHEAD, the name for several animals, characterized by the blackness of the head; especially in the United States: (1) the scaup duck; (2) a common minnow, the fathead. The name is also applied to the accumulations of dirt found in the sebaceous follicles.

BLACKHEATH, England, an elevated heath in the county of Kent chiefly in the metropolitan borough of Lewisham. It borders on Greenwich Park, contains 267 acres, and is a place of popular resort. In 1381 Wat Tyler and John Ball mustered their followers here. Jack Cade occupied the same position twice in 1450. In 1497 the Cornish insurgents, under Lord Audley, were routed there by the King's forces. Blackheath has been the scene of many historical pageants and processions. Henry IV met there (1400) the Byzantine emperor, Michael Palæologus; the corporation of London there met Henry V, on his return from Agincourt; and the year afterward, the Emperor Sigismund. One of the last was the reception of Anne of Cleves, by Henry VIII, in 1541. The Roman road to Dover crossed Blackheath. Consult Drake, ‘History of Blackheath’ (London 1886).

BLACKHORSE, a fish, one of the suckers of the Mississippi Valley (*Cycleptus elongatus*); also known as the Missouri or gourdseed sucker. It is about two feet long, with a small head, suggesting, in profile, that of a horse, and becomes almost jet-black in spring. See Sucker.

BLACKIE, John Stuart, Scottish poet, litterateur and professor: b. Glasgow, 28 July 1809; d. 2 March 1895. He was educated at the universities of Aberdeen and Edinburgh; subsequently went to Göttingen, Berlin and

Rome, where he continued his studies, which were chiefly connected with philology. In 1834 he published a translation of Goethe's 'Faust,' and the same year became an advocate at the Scottish bar; in 1841 he was inducted to the chair of humanity in Marischal College, Aberdeen. This position he held until, in 1852, he was appointed to the professorship of Greek in the University of Edinburgh, a chair which he resigned in 1882. By his unwearied efforts to preserve the Gaelic language, he succeeded in raising $60,000, with which sum a Celtic chair was endowed in Edinburgh University. He was one of the most popular Scotsmen of his time, his breezy, unconventional personality making him a favorite with all classes. Perhaps his most enduring work is the hymn he wrote on his honeymoon, "Angels holy, high and lowly." Among his more important writings are 'Lyric Poems'; 'Homer and the Iliad'; 'Horæ Hellenicæ'; 'Self-culture'; 'Songs of Religion and Life'; 'Lays of the Highlands and Islands'; 'Lay Sermons'; 'Altavona'; 'Wisdom of Goethe'; and 'Life of Burns.' His biography has been published (2 vols.) by Anna M. Stoddart.

BLACKING, the article employed in blacking boots and shoes, usually contains for its principal ingredients oil, vinegar, ivory, or bone black, sugar or molasses, and strong sulphuric acid, though every manufacturer has his own recipe, and endeavors to turn it to best account by concealing its composition and puffing its merits. Blacking is used either liquid or in the form of a paste, but both are obtained from the same ingredients, the only difference being that in making the paste a portion of the liquid is withheld. Blacking was introduced into England from France in the latter part of the 18th century. A celebrated old English blacking consists of 18 ounces of caoutchouc dissolved in 9 pounds of hot rape-oil, 60 pounds ivory-black, 45 pounds molasses, and 20 gallons vinegar, of strength No. 24, in which one pound finely ground gum-arabic has been dissolved. The whole mixture, after being carefully triturated in a grinding mill, receives 12 pounds sulphuric acid, in small successive quantities, stirring strongly for half an hour. The stirring is continued for half an hour daily during a fortnight, and then three pounds of gum-arabic are added, after which the stirring is resumed, and continued as before for another fortnight. This gives fine liquid blacking; the paste is obtained within a week by withholding 8 of the 20 gallons in which the gum-arabic is dissolved. Shoe blacking in liquid form may be made from powdered graphite (1 pound), lampblack (1 ounce), rosin (4 ounces) and turpentine (1 gallon). Graphite is the principal ingredient in many stove polishes. The solid cakes of stove polish are made by subjecting the powdered graphite, mixed with turpentine, to great pressure.

BLACKLEG, a cattle disease. See BLACK-QUARTER.

BLACKLEGS, a name commonly applied in England to cheating gamblers; during the labor agitation in 1889 and 1890 the name was given to non-unionist workmen by the members of trade unions. In this latter sense the word is now exclusively used, and corresponds with the American epithet "scabs."

BLACKLIST, The, name applied to a war measure adopted by the British government in accordance with an Order in Council of 23 Dec. 1915, prohibiting British subjects from trading with specified firms and persons residing or established in neutral countries. From time to time lists of such proscribed firms had been published in the official London *Gazette*, and included a considerable number of Japanese firms and business houses established in various countries of Europe, South America and Asia. On 18 July 1916 the *Gazette* issued a list giving the names of 82 firms "domiciled" in the United States. Of these, 72 were established in New York city, three in Pennsylvania, two in Texas, two in California, one in Seattle and one each in Virginia and Florida. The names did not appear in the London newspapers. The publication of the "blacklist" in the American press created considerable sensation, and vigorous protests were raised on the ground that the inhibition constituted an unwarrantable interference with American trade. The government was called upon from many sides to take steps of a retaliatory nature if the offending list were not repealed. On 22 July Mr. L. W. Evans, Chief of the Department of Foreign Trade of the British Foreign Office, informed a representative of the Associated Press in London that the list had been compiled with the sole object of prohibiting British citizens from supporting firms which were strengthening the German enemy. He stated that the test applied before placing a firm in the United States on the list was: "Is that firm by its business operations strengthening our enemies? If so, then British firms may not support it." As the prohibition extended to British shipping carrying freight for any such firms, and rendered their cargoes on neutral vessels liable to prize court confiscation, shipping companies were unwilling to take the risks involved. Thus on 20 July the Royal Dutch Mail Steamship Company, running vessels to the West Indies, announced that they would not accept any freight from shippers whose names appeared on the British blacklist, or take cargo for consignees similarly placed. Many other neutral shipping firms took the same course. The Teutonic Sons of America seized the opportunity to despatch a communication to the President, accusing him of "wavering," recalling Jefferson's words that "England is still our enemy," and suggested an embargo on munitions and provisions. British officials in Washington contended that no legitimate American firm or corporation would be injured by the blacklist, nor any German firm in the United States which had confined its operations to its own line of business; in short, that British subjects were prohibited from having any dealings with only such firms as were known to be actually under German control; whose profits went to Germany; or in cases where either German or American firms in the capacity of agents had departed from their regular lines to trade with Germany. Thus, for example, the British government knew that a German-American firm in New York had shipped a large quantity of nickel on the submarine *Deutschland*, yet that firm was not placed on the blacklist because dealing in such metal was part of its ordinary business. The Washington correspondent of the New York *Sun* reported (25 July) that the British list had not been published until the acquiescence of several banking institutions in New York had been obtained. «The banks were convinced that the blacklisted firms had been maintaining Germany's trade relations in South America, and that they were in a position to do this only because they were domiciled in a neutral country . . . and that the only effect of the boycott would be to transfer the business of German to American firms.» The *Wall Street Journal* (25 July) expressed a hope that the government would not make a protest, on the ground that the Allies exercised «a power which belongs to every state, to regulate the conduct of its own citizens . . . For its own preservation, the (United States) government regulated the business affairs of its citizens in neutral countries when (in 1863) their activities might even indirectly aid an enemy. It was a legitimate exercise of its power.» Meanwhile, the Allies (for France had issued the same list) had searched American records and discovered that on 16 Aug. 1861 President Lincoln issued a proclamation declaring that «all commercial intercourse between the States in insurrection and citizens of the United States is unlawful, and will remain unlawful until such insurrection shall cease.» In the following year (26 May 1862) an act of Congress authorized the Secretary of the Treasury to refuse clearance to ships where their cargoes, «whatever their ostensible destination,» were intended for points or places in possession or under the control of insurrectionists against the United States. From these precedents, apart from other considerations, the British government maintained its right to forbid its own nationals to trade with persons who openly or secretly aided the enemies of Great Britain. Acting State Secretary Polk instructed Ambassador Page (24 July) to inform the British Foreign Minister that the United States government must «protest in the most decided terms» against the «arbitrary interference with neutral trade.» The protest was presented on the 28th, and in his reply (10 Oct. 1916) Lord Grey of Fallodon described the measure as «a piece of purely municipal legislation . . . part of the belligerent operations designed to weaken the enemy's resources.» He pointed out «that many Germans in neutral countries have done all in their power to help the cause of their own country and to injure that of the Allies . . .; that German houses abroad have in a large number of cases been used as an integral part of an organization deliberately conceived and planned as an engine for the furtherance of German political and military ambitions . . .; German business establishments in foreign countries have been not merely centres of German trade, but active agents for the dissemination of German political and social influence, and for the purpose of espionage. . . . Such operations have been carried out in the territory even of the United States itself.» The prohibition, he repeated, applied only to «persons in the United Kingdom,» and that the measure was «simply one which enjoins those who owe allegiance to Great Britain to cease having trade relations with persons who are found to be assisting or rendering service to the enemy.»

Shortly before the American blacklist was issued the Allies had held an «Economic Conference» in Paris (14–17 June 1916), at which it was decided that «The Allies will prohibit their own subjects and citizens and all persons residing in their territories from carrying on any trade with (1) the inhabitants of enemy countries whatever their nationality; (2) enemy subjects wherever resident.» As a result of American representations, the names of several firms were removed from the blacklist; the prohibitive ordinance on British subjects was rigorously maintained. Several British business men found guilty of indirect trading with the enemy were heavily fined and sentenced to terms of imprisonment.

The total number and distribution of firms placed upon the blacklist were — Argentine and Uruguay, 95; Bolivia, 22; Brazil, 140; Central America, 5; Chile, 35; Columbia, 1; Cuba, 10; Ecuador, 69; Greece, 50; Holland and colonies, 190; Japan, 86; Morocco, 88; Norway, 83; Paraguay, 3; Persia, 56; Peru, 41; Philippines, 44; Portugal and colonies, 166; Spain, 167; Sweden, 72; and United States, 85. See Blacklisting.

BLACKLISTING. A method employed in various countries to place upon record for the guidance of others the names of persons or firms whom it might not be desirable to employ or to have business relations with. Lists of those against whom unsatisfied judgments are standing, or whose credit is poor, or who have given chattel mortgages on stock in trade and lists of a similar nature have been published by mercantile agencies and are not only regarded as of great benefit to the business world but also fair and lawful. The publisher or compiler of such list must be careful that, in printing a person's name, he do not subject himself to a libel suit. He must be able to prove that his statements about the blacklisted person are true, or that they were correctly transcribed from some public record, or that they constituted a fair and accurate report of some judicial proceeding, or that the information contained in the statements was secured in a privileged manner, such as a report of financial standing of a person or firm asking credit of another. But the blacklist is more widely known for its use in labor controversies. For many years railroads kept lists of employees dismissed for any reason so that they could not be re-employed. Manufacturers and dealers who have formed an association or combination to control a certain line of industry have blacklisted others who refused to enter the association. The blacklist of the early period of labor controversies was a printed list of the names of workmen, circulated among employers, who had previously agreed not to employ those so listed. Labor unions have kept lists of non-union workmen with the object of preventing the laborers or of employers of non-union employment of the workmen or of boycotting the employer. Such lists are now termed a misdemeanor in the statutes of some States.

and offenders are punishable by a fine or imprisonment. The central offices of employers' associations keep a list from which information regarding workmen is exchanged, thus coming within the law. See BLACKLIST; BOYCOTT; STRIKES AND LOCKOUTS; TRADE UNIONISM; LABOR LEGISLATION; LIBEL; CONSPIRACY.

BLACKMAIL, originally rent paid in labor, grain or baser metal as distinguished from silver or white money; a certain rate of money, corn, cattle or the like, anciently paid, in the north of England and in Scotland, to certain men who were allied to robbers, to be protected by them from pillage. It was carried to such an extent as to become the subject of special legislation by the English Parliament in 1601, and also in Scotland. Blackmail was levied in the unsettled districts bordering the Highlands of Scotland till the middle of the 18th century. In the United States, in common language and in general acceptation it is equivalent to and synonymous with extortion — the exaction of money, either for the performance of a duty, the prevention of an injury or the exercise of an influence. It supposes the service to be unlawful and the payment involuntary. Not unfrequently it is extorted by threats, or by operating upon the fears or the credulity or by promises to conceal, or to expose, the weaknesses, the follies or the crimes of the victim. There is moral compulsion, which neither necessity nor fear nor credulity can resist. The New York statutes upon the subject have been adopted in substance by many other States of the Union. These statutes provide, substantially, that a person who, knowing the contents thereof, and with intent, by means thereof, to extort or gain any money or other property, or to do, abet or procure any illegal or wrongful act, sends, delivers or in any manner causes to be forwarded or received, or makes and parts with for the purpose that there may be sent or delivered, any letter or writing threatening to accuse any person of a crime, or to do any injury to any person or to any property, or to publish or connive at publishing any libel, or to expose or impute to any person any deformity or disgrace, is punishable by imprisonment for a term usually not exceeding five years. In New York and in various other States it is also a misdemeanor for any person who, under circumstances not amounting to robbery, or an attempt at robbery, with intent to extort or gain any money or other property, verbally makes such a threat as would be criminal under the statute mentioned above; and it is immaterial whether a threat made as specified in the statute is of things to be done or omitted by the offender, or by any other person.

BLACKMAR, Frank Wilson, American educator, economist and author: b. West Springfield, Pa., 3 Nov. 1854. He studied at the University of the Pacific, and at Johns Hopkins University where he became instructor in history 1887–88 and fellow in history and politics 1888–89. He was appointed professor of history and sociology at the University of Kansas in 1889 and became active in the university extension movement throughout the West, writing and lecturing on history, sociology and economics. He organized the graduate school of the University of Kansas in 1897 and was elected its dean. In 1899 he was appointed professor of sociology and economics. He edited the 'Cyclopedia of the History of Kansas' and is author of 'Spanish Colonization' (1890); 'Spanish Institutions in the Southwest' (1891); 'History of Higher Education in Kansas' (1900); 'Life of Charles Robinson' (1900); 'The Elements of Sociology' (1905); 'Economics for High Schools' (1907); 'Play-grounds and Parks' (1910).

BLACKMORE, SIR Richard, court physician and poet: b. about 1650; d. 1729. He was educated at Westminster School and Saint Edmund Hall, Oxford; first took up teaching, but after graduating in medicine at Padua settled in London as a physician, holding appointments in the court of King William and Queen Anne. He had a gift for writing epics, all lengthy and written on the most exalted themes. He published 'Prince Arthur' (1695) and six other lengthy poems before 1723. His 'Creation' received high praise from such competent contemporary critics as Addison, Johnson and John Dennis, but the cooler judgment of posterity has pronounced all alike to be uniformly dull, heavy and tedious.

BLACKMORE, Richard Doddridge, English novelist: b. Longworth, Berkshire, 7 June 1825; d. 20 Jan. 1900. His father, curate of Longworth, and a graduate of Exeter College, Oxford, was a man of scholarly character; among his ancestors on his mother's side Blackmore numbered Philip Doddridge, the Non-Conformist divine. Blackmore was educated at Blundell's School at Tiverton and at his father's college, which he entered in 1843 with a good reputation for scholarship, and where he had a successful career. In one of his long vacations he began 'The Maid of Sker,' which was not published till 1872. He was graduated in 1847, with M.A. in 1852. In 1852 he married Miss Lucy Maguire, and while supporting himself in London read law in the Inner Temple. Admitted to the bar the same year, he had some success as a conveyancer, but finding London life detrimental to his health, gave up his work and in 1855 became classical master at Wellesley House School, Twickenham Common. In 1853 he published his first volume, 'Poems by Melanter,' and a little later 'Epullia,' also an anonymous volume of verses. In 1855 appeared 'The Bugle of the Black Sea,' and in 1860 'The Fate of Franklin.' About this time a legacy from his uncle, the Rev. H. H. Knight, enabled him to build himself a substantial country house, Gomer House, at Teddington, near Twickenham. Here he lived the rest of his life, devoting his mornings to the raising of fruits and flowers, famous for quality but costing him an average loss of £250 a year. The remainder of his time he gave over to literature. A translation of two of the Georgics of Virgil, entitled 'The Farm and Fruit of Old' (1862), was followed by 'Clara Vaughan' (1864) and 'Cradock Nowell' (1866), neither very successful novels. His third novel, 'Lorna Doone' (1869), after a somewhat slow start, became one of the great popular novels of the century; up to the time of Blackmore's death it had gone through nearly 50 editions, and has now assumed the place of a semi-classic. Uneven in structure, often prolix, exaggeratedly romantic, occasionally falling into a false metrical prose, it nevertheless continues to hold the interest of its readers through the fine sense of the Devon country where the scene is laid, the very real and human country types and the essentially manly character of its hero, John Ridd. Up to the time of his death, Blackmore continued to produce novels at the rate of about two in five years. Of these the most important are ‘The Maid of Sker,’ regarded by the author as his best, ‘Springhaven’ (1887) which he thought superior to ‘Lorna Doone,’ ‘Alice Lorraine’ (1875), and ‘Cripps the Carrier’ (1876). The other titles are ‘Erema, or My Father's Sin’ (1877); ‘Mary Annerley’ (1880); ‘Christowell’ (1882); ‘The Remarkable History of Tommy Upmore’ (1884); ‘Kit and Kitty’ (1889); ‘Perleycross’ (1894); ‘Tales from the Telling House’ (1896), and ‘Dariel’ (1897). A volume of verse, ‘Fringilla’ (1895), completes the list of his published work. No life has as yet been published, and most of the commentary on him is to be found in magazine articles and reviews. See LORNA DOONE.

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BLACKPOOL, England, town and county borough of North Lancashire on the west coast, between the estuaries of the Ribble and Wyre, 27 miles southwest of Lancaster, which attracts an annual average of 100,000 visitors by its advantages as a watering place. It affords excellent accommodation for visitors in the numerous hotels, hydropathic establishments and lodging-houses, and consists of ranges of lofty houses about three miles long facing the sea, in front of which extends an excellent promenade and carriage drive. The town is abundantly supplied with theatres, concert rooms, fine winter gardens, aquarium, extensive pleasure-grounds, park of 60 acres, a great steel tower over 500 feet high a gigantic wheel and other attractions. There are a courthouse and three markets, several churches, six council schools, eight non-provided schools and one for higher education, libraries and newsrooms. Blackpool was incorporated as a municipal borough on 21 Jan. 1876, and as a county borough 1 Oct. 1904. Resident population 58,500.

BLACKS. Black pigments are of two types: charcoal blacks or fixed blacks, and soot blacks. The charcoal blacks include those made by the carbonization of bones and ivory, as well as those made from charcoal of wood and animal refuse. The soot blacks include carbon black or gas black, and lamp black.

Charcoal black is made by heating wood in closed retorts till it is charred through and through, and grinding the residue, after which it is thoroughly washed. The finest grade of charcoal black is that made by carbonizing cork. It is fine, smooth and of considerable body. A highly esteemed grade is Frankfort black, also known as drop black and vine black. It is made by carbonizing twigs of grapevines, to which are added hop vines, peach and plum stones, and sometimes chips and shavings of bone. Animal black is the name given to the pigment produced by charring the offal of slaughter-houses. Cheap charcoal blacks are of poor covering power, but are excellent as preservatives, and useful especially in making the gray or «lead-colored» priming coat so commonly applied to new work by painters.

Bone black is prepared by grinding the carbonaceous matter resulting from the charring of bones in iron retorts. It contains about 15 per cent carbon; 78 per cent calcium phosphate; and 7 per cent calcium carbonate, alumina, silica and iron combined. It has a specific gravity of 2.7. The grinding does not produce a uniformly smooth powder, there being always more or less grit of hard charred bone. Ivory black is made sometimes of ivory waste but more commonly of selected bone. It is a favorite with painters, having a «tooth» which is lacking in the soot blacks. It is, however, slow to dry, and a drier is usually added. Its lack of covering power is helped out by the addition of some rich velvety black, generally lamp black. The highest grade of plate ink used by printers is made from the choicest bone black with the addition of vine black and a little Prussian blue. To make the ordinary paste in which form paints are usually marketed, bone black requires the addition of 50 per cent of its weight in oil. Large quantities of bone black are used by the sugar refineries to decolorize raw sugar in solution, no other substance having been discovered of equal or even approximate efficiency. After this use the bone black goes generally to the fertilizer manufacturers, but a part comes into the paint industry.

Carbon black, a very pure form of carbon, is made by the combustion of gas in a scanty supply of air. The flames are thrown against metal or slate slabs or upon revolving cylinders. The accumulating black is scraped off and ground. It has a granular texture and requires a great deal of grinding to make a smooth pigment. Carbon black has great staining power and requires 82 per cent of its weight in oil to produce the paste form in which it is marketed — as «ground in oil.» In the dry form it was formerly packed in barrels, but was found to absorb moisture. This tendency has been overcome by packing it in paper sacks. The best grades of carbon black are used in making black varnishes and printers' inks. With white, carbon black gives brownish-gray hues.

Lamp black is a nearly pure carbon made by the combustion of oils in an atmosphere lacking in oxygen. The larger part of the commercial supply is made from the dead oils distilled from coal tar and from wood tar, petroleum, rosin, etc. The choice grades are made from seed oils. Any material which in a plentiful supply of oxygen gives a highly luminous flame will produce lamp black when the air supply is cut down. The oils are ignited in a limited supply of air so that the combustion is imperfect and intensely smoky. The smoke is passed through a long series of chambers, and against and around many upright partitions on which the soot or lamp black is deposited. In Germany lamp black is made by passing the smoke from resinous wood through hanging woolen blankets. The soot is shaken from the blankets at intervals. Ordinary lamp black will weigh from 100 to 120 pounds to the (flour) barrel; the finest grade will weigh but 30 pounds to the barrel. It is required that lamp black test not more than 0.2 of 1 per cent of ash. To make the buttery paste in which the tinned lamp black is sold requires 75 to

76 pounds of oil to 24 or 25 pounds of lamp black. As a pigment lamp black is noted for its remarkable covering power. The cheaper grades are made into common printing ink; the finer grades cannot be used for this purpose as they require more than the limit of 65 per cent oil, the utmost that can be permitted in printing ink.

According to the United States census of manufactures for 1914 there were in operation 27 establishments devoted exclusively to the manufacture of bone black, carbon black and lamp black. These establishments employed 437 persons, of whom 339 were wage earners receiving annually $230,821 in wages. The capital invested was $4,995,400, and the value of the year's output was $1,463,569, of which $777,329 was the value added by manufacture. In addition, there were 19 other establishments in which some of these products were made. The total production of blacks by all makers in 1914 was valued at $2,949,797; comprising carbon black, $900,630; lamp black, $517,167; and bone black, $1,532,000. Among the States, West Virginia ranked first in production of blacks, turning out 54.5 per cent of the entire product of the country. Pennsylvania ranked second. Both of these States make their product from natural gas.

BLACKSNAKE, or **BLACK RACER**, a common colubrine serpent (*Zamenis constrictor*) found in eastern North America from southern Canada to Florida and west to the prairie regions of the United States. The typical eastern blacksnake is uniform lustrous black above and slate-color beneath, the lower jaw, chin and sometimes upper edges of the lip-plates white, the tongue black. West of the Mississippi the typical form is replaced by a distinct variety, the «blue racer,» slenderer and smaller. The young of the blacksnake, under 18 inches in length, are pale gray above, with brownish blotches on the back, and numerous black spots on the side. The female is larger than the male, but rarely if ever exceeds six feet in length; length of tail 17½ inches. This is one of the most numerous and vigorous of American snakes, making its home in hollow stumps and underground dens. At the approach of winter, many are likely to gather together in similar retreats and remain there in a torpid condition until spring, entangled into a ball, for the sake of mutual warmth. Its motions are of the swiftest, it being capable of moving with great rapidity and of scaling trees, sometimes to a height of 100 feet above the ground, where it searches from branch to branch for birds' eggs, young squirrels, etc. It seeks much of its food in swamps and along streams, mainly frogs, toads, eggs and young of birds, insects and other snakes, and is a fine swimmer. The blacksnake is harmless, and its bite is no worse than that of a mouse. It is readily tamed, thrives well in captivity and shows some intelligence. It is unaggressive, alert in getting away from danger and will not fight unless cornered. The stories recorded of its scenting out copperheads and rattlesnakes and slowly crushing them to death are fables, as it has no power of constriction, and will only attack snakes much smaller than itself. The blacksnake breeds during the summer, the female laying 15 or 20 eggs at a time in the hollow of a sunny bank, or in the midst of a decayed stump, around which she stays, guarding her young until they reach a considerable age.

Several other species of the genus belong to the southwestern United States, Mexico and the West Indies, and the Texan whipsnake is a near relative. The «chainsnake» is sometimes called «mountain blacksnake.» Other blackish serpents known as blacksnakes include a colubrine of Jamaica (*Ocyophis ater*); the death adders of Australia and Tasmania, and some others notable for dark hues. One of the most widespread of the native names of the East Indian Cobra de Capello has the meaning «blacksnake.»

BLACKSTOCKS HILL, South Carolina, a locality where, on 20 Nov. 1780, the patriots of the State, under General Sumter, defeated Tarleton's cavalry after a sharp encounter.

BLACKSTONE, William, early colonist of New England: d. 1675. He left England because of differences with the authorities of the Church of England and was the first white settler on the site of Boston, Mass., in 1623. Disliking the arbitrary methods of the Puritans he sold his 800 acres for £30 in 1634 and removed to what is now Rhode Island where he was also the first white settler. Consult Winsor, ‹Memorial History of Boston› (Boston 1880).

BLACKSTONE, Sir William, English lawyer, and the most popular writer on the laws and constitution of his country: b. London, 10 July 1723; d. 14 Feb. 1780. He was educated at the Charterhouse, whence in 1738 he was removed to Pembroke College, Oxford. He was much distinguished, both at school and at the university. Having chosen the profession of the law, he was in 1741 entered at the Middle Temple, and on this occasion published the admired verses called the ‹Lawyer's Farewell to His Muse,› which appeared in ‹Dodsley's Miscellany.› In 1744 he was elected fellow of All Souls College, Oxford, and in 1746 was called to the bar, and commenced the practice of law. Being deficient in the art of elocution, and not possessed of the popular talents of an advocate, his progress was slow. Having attended the courts of law at Westminster for seven years without success, he determined to quit the practice of his profession and retire to his fellowship at Oxford. The system of education in English universities makes no provision for teaching the laws and constitution of the country, Blackstone undertook to remedy this defect by a course of lectures on that important subject; and the manner in which he executed the task has conferred a lasting distinction on Oxford. His first course was delivered in 1753, and was repeated for a series of years with increasing effect and reputation. These lectures doubtless suggested to Mr. Viner the idea of founding, by his will, a liberal establishment in the University of Oxford for the study of the common law; and Blackstone was appropriately appointed the first Vinerian professor. His engagements at Oxford did not prevent his occasional practice as a provincial barrister; and in 1754, being engaged as counsel in a contested election for the county of Oxford, he was led into considerations on the elective franchise, which produced his work entitled ‹Consideration on Copyholders' (1758). In 1759 he published a new edition of the Great Charter and Charter of the Forest, with an historical preface; and during the same year, the reputation which he had obtained by his lectures induced him to resume his attendance at Westminster Hall, when business and the honors of his profession soon crowded in upon him. In 1761 he was elected member of Parliament for Hindon, Wilts, made king's counsel and solicitor-general to the Queen. About this time he married, and thereby losing his fellowship, was appointed principal of New Inn Hall (1761) which office he resigned in 1766. In 1765 he published the first volume of his 'Commentaries on the Laws of England'; a work of greater merit than any which had yet appeared on the subject, and which has brought him lasting fame. He was returned for Westbury in 1768. The real merit and talents of Blackstone, backed by political influence, now made him an object of ministerial favor, and he was offered the post of solicitor-general in 1770, and, declining it, was made one of the justices of common pleas, which station he held until his death, in his 57th year.

BLACKSTONE, Mass., town in Worcester County, on the Blackstone River, and on the New York, New Haven and Hartford Railroad. It is an important manufacturing town, first settled in 1700, and is the centre of an extensive agricultural region. It has several churches, schools, library, weekly newspapers, electric lights and excellent water power. Pop. 5,648.

BLACKSTONE, Va., town in Nottoway County, on the Norfolk and Western Railroad, 35 miles west of Petersburg. It is situated in a tobacco-growing and dairying region and has manufactories of tobacco, home-building materials, fertilizer, excelsior, barrel-headings, a canning establishment and a creamery. It has two banks with total resources of about $1,000,000, assessed property valuation of $900,000, a girls' college, a military academy, high school, a music hall and five churches. It has also a water supply system, a sewer plant and electric-lighting plant. The government is on the general manager plan, with a mayor and seven councilmen. Pop. (1920) 1,381.

BLACKSTONE RIVER, Mass., a river of eastern New England; rises in Paxton and Holden townships, Worcester County, flows southeast into the State of Rhode Island, and empties into the Providence River, near Providence, where it is known as the Seekonk. It is over 50 miles long, and falls over 700 feet, thus affording abundant waterpower, and for a great part of its course flows through an almost continuous line of manufacturing establishments.

BLACKTAIL, the name of two different species of western American deer, notable for the blackness of the tail as compared with the snowy white tail of the eastern or «white-tailed» deer. One of them is more suitably called «mule» deer, and is described elsewhere under that title. The other is the Columbian or Pacific Coast deer (*Cervus,* or *Odocoileus, columbianus*).

The Columbian blacktail is somewhat smaller than the mule deer, with relatively shorter ears and finer hair. The general color in summer is red or reddish-yellow; in winter the color is more varied. The coat is then brownish-gray, darkest along the spine; top of head, chestnut and black; face gray, with a black spot on the forehead, passing backward as a stripe over each eye; chin white, behind which is a black patch; upper throat, posterior portion of under part, and base of tail, white; chest, sooty; legs, dark cinnamon, white inside, and rest of under parts covered with black; upper surface of the tail, black. The antlers of the buck resemble those of the mule deer. This deer is limited to the Pacific coast, from central California northward to Alaska, and does not pass east of the coast ranges of mountains. It is a deer of the woods, frequenting the foot-hills and valleys, especially those covered with small brush; and its habits and gait more nearly resemble those of the white-tailed deer than of the mountain-loving mule deer. Its hunting affords excellent sport, and its venison is highly prized. See also DEER. Consult Farrell in Shields' 'Big Game in North America' (Chicago 1890), and VanDyke, 'The Deer Family' (New York 1902).

BLACKTHORN, a shrub or small tree. See SLOE.

BLACKWATER FEVER, an obscure but very fatal infectious disease especially prevalent in the low coastal regions of tropical Africa; but wide in its distribution, being known also in Asia, the West Indies, the Southern States of the American Union, Italy and Greece. The disease is mainly confined to the white race. It is induced by the destruction of the red blood corpuscles, which may be caused by the too free use of quinine or from exposure to cold. Weakening of the system from frequent malarial attacks is also a contributory cause. The disease is accompanied by great prostration, vomiting, enlargement of the liver and spleen and the passing of black urine. The patient becomes jaundiced in color. An almost invariable symptom is nephritis. The presence of a small annular non-pigmented intra-cellular parasite has been detected in the blood of sufferers from the disease.

BLACKWELL, Alice Stone, American reformer, editor and author: b. East Orange, N. J., 14 Sept. 1857. A graduate and later a trustee of Boston University, she was early associated with her father and mother in editing *The Woman's Journal* and from 1885 to 1905 also edited *The Women's Column.* As chairman of the literature committee of the National American Woman Suffrage Association and a forceful contributor to the *Political Equality* series and to periodical literature she became prominent in the cause of woman suffrage, and also worked on behalf of the oppressed Armenians and others. Her published works include 'Armenian Poems' (1896); 'Songs of Russia' (1906); 'Songs of Grief and Joy' translated from the Yiddish of Ezekiel Leavitt (1908). Her father was a brother and she is the niece of the well-known physicians Elizabeth and Emily Blackwell (q.q.v.); also edited 'The Little Grandmother of the Russian Revolution; Reminiscences and Letters of Madam Breshkovskaya' (1917).

BLACKWELL, Mrs. Antoinette Louisa (BROWN), American woman suffragist and Unitarian minister: b. Henrietta, N. Y., 20 May 1825. A graduate of Oberlin College (1847), she «preached on her own orders,» at first in Congregational churches, becoming at length a champion of women's rights. She married Samuel C., a brother of Dr. Elizabeth Blackwell (1856). She has written 'Shadows of Our Social System' (1855); 'The Island Neighbors' (1871), a novel of American life; 'Sexes Throughout Nature' (1875); 'The Physical Basis of Immortality' (1876); 'The Philosophy of Individuality' (1893); 'Sea Drift, or a Tribute to the Ocean' (1903).

BLACKWELL, Elizabeth, American physician: b. Bristol, England, 3 Feb. 1821; d. London, 1 June 1910. In 1831 her father and family came to New York and in 1837 settled in Cincinnati, where he died soon after. For some years Elizabeth helped her mother to support eight other children by keeping a boarding school. In 1844 she resolved to become a physician and overcoming much serious opposition obtained admission to Geneva Medical College, Geneva, N. Y., where she was graduated with highest honors 1849, being the first woman to obtain a medical degree in the United States. She studied later with her sister Emily in Paris, again overcoming all opposition, and together in 1853 they started in New York, the Infirmary for Women and Children, the first institution of its kind conducted solely by women. In 1868 they founded the Woman's Medical College of the New York Infirmary which was afterward affiliated with Cornell Medical College when that institution became coeducational. In 1869 Dr. Blackwell settled in London and assisted in founding the National Health Society of London and the London School of Medicine for Women. She lectured extensively on medical and educational topics and wrote among other books 'The Physical Education of Girls' (1852); 'Moral Education of the Young' (1879); 'The Human Element in Sex' (1884); 'The Influence of Women in Medicine' (1889), and 'Pioneer Work in Opening the Medical Profession to Women' (1895).

BLACKWELL, Emily, American physician: b. Bristol, England, 1826; d. London, 8 Sept. 1910. Following the example of her sister Elizabeth, after being refused admission to medical study at 11 different schools, including Geneva Medical School which had admitted her sister, she entered the Bellevue free hospital in New York city and later was received by the Western Reserve University where she completed her course. She studied in Edinburgh and in Paris with her sister, and was associated with her through all her professional career.

BLACKWELL, George Lincoln, American author and bishop of the African Methodist Episcopal Zion Church: b. Henderson, N. C., 2 July 1861. His parents were slaves. He was graduated from Livingstone College, Salisbury, N. C., in 1888, and from Boston University School of Theology 1892. He became dean of Livingstone College Theological School of the African Methodist Episcopal Zion Church 1893–96, general agent of the denominational publishing house and editor 1896–1900; general secretary 1900–04, combined with missionary secretary (1904–08) and bishop 1908. He was the delegate of his Church to the Ecumenical Councils at London (1907) and at Toronto (1911). He is the author of 'The Model Homestead' (1893); 'Cloaks for Sin' (1904); 'A Man Wanted' (1907).

BLACKWELL, Lucy Stone. See STONE, LUCY B.

BLACKWELL, Thomas, Scottish classical scholar: b. Aberdeen, 4 Aug. 1701; d. Edinburgh 1757. He was graduated at Marischal College in his 18th year, and was appointed professor of Greek when 22, and principal in 1748. His works include 'Inquiry into the Life and Writings of Homer' in (1737); 'Proofs of the Inquiry into Homer's Life and Writings'; 'Letters Concerning Mythology' (anon., 1748), and 'Memoirs of the Court of Augustus' (Vol. I, 1753; Vol. II, 1755 and Vol. III posthumously in 1764).

BLACKWELL, Okla., city in Kay County, 110 miles north of Oklahoma City, on the Chikaska River, and on the Atchison, Topeka and Santa Fé and the Frisco Lines. Oklahoma State College (Baptist) is located here. In the neighborhood are large deposits of natural gas. The city's industries comprise brick, clay and glass works and flouring mills. Pop. 7,174.

BLACKWELL'S ISLAND, N. Y., an island in the East River belonging to New York city. It has an area of about 120 acres, and contains the penitentiary, almshouse, lunatic asylum for females, workhouse, blind asylum, hospital for incurables and a convalescent hospital. Nearly all of these buildings were erected from granite quarried on the island, by convict labor, the style of architecture being of a turreted and battlemented design of feudal character. The island is bordered by a heavy granite sea wall, also built by the convicts, and a large amount of farming and gardening is carried on by inmates of the penitentiary.

BLACKWOOD, Adam, Scottish writer: b. Dunfermline, 1539; d. 1613. Scotland, during his youth, was undergoing the agonies of the Reformation. He therefore found it no proper sphere for his education, and went to Paris, where, by the liberality of his youthful sovereign, Queen Mary, then residing at the court of France, he was enabled to complete his studies, and to go through a course of civil law at the University of Toulouse. Having now acquired some reputation for learning and talent, he was patronized by James Beaton, the expatriated archbishop of Glasgow, who recommended him very warmly to Queen Mary and her husband, the Dauphin, by whose influence he was chosen a member of the Parliament of Poictiers, and afterward appointed to be professor of civil law at that court. His first work was one entitled 'De Vinculo Religionis et Imperii, Libri Duo' (Paris 1575), to which a third book was added in 1612. His next work was entitled 'Apologia pro Regibus,' and professed to be an answer to George Buchanan's work, 'De Jure Regni apud Scotos.' He next published, in French, an account of the death of his benefactress, Queen Mary, under the title, 'Martyre de Maria Stuart Reyne d'Escosse' (1588). At the end of the volume is a collection of poems in Latin, French and Italian, upon Mary and Elizabeth, in which the unfortunate Queen is praised for every excellence, while Elizabeth is characterized by every epithet expressive of indignation and hate. In 1644, 30 years after his death, appeared his 'Opera Omnia,' in one volume, edited by the learned Naudeus, who prefixes an elaborate eulogium upon the author.

BLACKWOOD, William, Scottish book seller, known as the projector and publisher of *Blackwood's Magazine:* b. Edinburgh, 20 Nov. 1776; d. 16 Sept. 1834. He settled in his native city as a bookseller in 1804, and soon added the trade of a publisher to his original business. The first number of *Blackwood's Magazine* appeared on 1 April 1817, and from the first it was conducted in the Tory interest. It was started just at the time when the general peace which had been established in Europe was beginning to reanimate the hopes of the Whigs, and when it was all the more necessary for the Tories to defend by the press that preponderance which they still held in Parliament. Mr. Blackwood was fortunate enough to secure as coadjutors in his new literary undertaking most of the leading authors of the day belonging to the Tory party, among them John Gibson Lockhart, Hogg (the Ettrick Shepherd), Professor Wilson (Christopher North), De Quincey (the English Opium-eater), and others. All that was connected with the management of the magazine he took into his own hands, and he himself selected the articles for each number — a task for which he was admirably qualified, for although he wrote little himself, he was an admirable judge of literary work. The new magazine on its first appearance entered upon a campaign against the *Edinburgh Review,* combating both its political views and its literary decisions. From the first it attracted a great deal of attention, and its success was decided by the appearance of the 'Noctes Ambrosianæ,' a series of articles in the form of dialogues, in which the current questions in politics and literature were discussed with the most pungent sarcasm and inexhaustible humor. The brilliant articles of Dr. Maginn added not a little to its reputation, and constantly, as the original contributors withdrew, new and valuable accessions were made to the staff of its supporters. After his death his business continued to be carried on by his sons, and the magazine he founded still maintains the Tory tradition as well as the high literary reputation of its early days. Consult 'William Blackwood and His Sons,' by Mrs. Oliphant and Mrs. Porter (3 vols., 1897–98).

BLACKWOOD. See Dalbergia.

BLACKWOOD'S MAGAZINE. See Blackwood, William.

BLADDER, the muscular organ that in man and the lower animals holds the urine. The kidneys secrete urine constantly, the bladder stores it and only empties itself at more or less definite intervals. In man the bladder is a flattened rounded to conical organ about the size of an orange, and holding under normal conditions about 16 ounces of urine (one pint). It is situated in the lower portion of the abdominal cavity just behind the pubic bone, which serves as a protection. Its general shape is rounded triangular, the flat side being above, the ureters leading from the kidneys entering at the corners; the pointed end corresponding to the opening into the urethra, through which canal the urine is voided. The walls of the bladder are made up of several layers; the outer wall is of peritoneum in part, or serous and connective tissue combined. The greater part of the wall is made up of involuntary muscle fibres arranged longitudinally and circularly; the innermost coat is thin and delicate, — the mucous membrane,— and is lined throughout by layers of regularly flattened squamous epithelial cells. The nervous supply of the bladder, by means of which it is emptied, is complex and probably threefold. It is under the influence of the vegetative nervous system of the hypagastric plexus; there are subsidiary centres in the spinal cord and higher up in the human cortex certain voluntary efforts have their influence on the bladder control. The primary receptor nerve cells of the vegetative system are in the bladder wall. These cause the bladder in the young infant, and also in the patient whose spinal cord control pathways are cut off, to be emptied and in the so-called irritable bladder it is probable that this part of the mechanism is mostly affected.

There is a very marked relation between the skin activities and the kidney and bladder action, for while the skin is acting freely as in exercise in warm weather, a large amount of water is thus given off, which in cold weather is eliminated through the kidneys and thus by the bladder. This is noted daily when in cold weather one leaves the warm house and shortly after walking in the cold of the outside air, the desire to urinate becomes urgent. Irritability of the bladder, particularly in children, and bedwetting is often a very troublesome complaint. It may be due to a variety of causes; excessive irritation, however, would probably not result in bedwetting, particularly in older children, if the control (inhibition) normally maintained by the brain were not cut off by deep slumber, thus permitting unconscious trends of the child to come to the fore. These unconscious trends are usually of an erotic nature, hence the treatment by psychoanalysis is indicated. Infection of the bladder is very frequent following gonorrhea and leads to many serious complications. (See Cystitis). Stones also develop in the bladder. See Calculus.

Paralysis of the bladder *per se* is a rare affection; paralysis of the sphincter that controls the outlet may result from a variety of causes. It usually results in incontinence of urine. Retention is an opposite condition and is frequently due to loss of vegetative nerve action, such as follow labor, or an operation, or from the anæsthesia of opium, belladonna or similar narcotics. It may also be due to mechanical obstruction, in old men, particularly being due to an hypertrophied prostate gland. In many effeminate individuals weakness of the bladder is a symptom of conscious or unconscious masturbation. Weakness of the bladder with either retention or increased frequency of urination is a frequent early sign of severe nervous disorders, such as paresis, tabes, multiple sclerosis, tumor of the spinal cord. Consult Jelliffe and White, 'Diseases of the Nervous System' (1917).

Smith Ely Jelliffe.

BLADDER, Diseases of. These may be classed as malformations, injuries and diseases proper. Occasionally the intestines and ureters enter a common pouch, cloaca, as in certain lower animals. Rarely the bladder is absent entirely. One of the most frequent malformations is exstrophy, in which there is no front wall to the bladder, it opening directly, from failure of the anterior abdominal wall to close. The hind wall of the protruding bladder becomes red and irritated and inflamed. The treatment is exclusively surgical, save when the exstrophy is slight or incomplete, when certain types of apparatus may be found efficient. Diverticulum of the bladder is another form of malformation. Here small sacculations are present, which, usually filling with residual urine, give rise to a cystitis. Hernia of the bladder consists in a displacement which may be congenital or acquired. It may occur at the site of other ruptures of the body, chiefly inguinal in man, and vaginal or femoral in women. Cystitis is the chief danger here as well and the treatment is surgical. Wounds of the bladder are infrequent save in war times when they are apt to be extremely prevalent and usually complicated by splintered wounds of the pelvis. Infection is less apt to occur and most punctured wounds of the bladder are readily treated surgically. Rupture of the bladder usually results from severe crushing accidents. Occasionally, in the diseased bladder, the pressure of retained urine may cause rupture; rarely this occurs during labor. The initial symptoms are usually as if something gave way on the inside. If the bladder has been greatly distended there may be a momentary feeling of relief. Pain in the whole abdominal cavity soon develops. Shock is added, the patient is prostrated and unable to walk. Treatment by surgical means is imperative.

Tumors of the bladder are frequent. They are papilloma, carcinoma, myoma, fibroma and sarcoma. These tumors are usually accompanied by intermittent bloody urination and by pain. Cystitis develops and even non-malignant tumors — i.e., those other than sarcoma or carcinoma,— may cause death from the changes which follow the cystitis, pus kidneys, etc. Exact diagnosis of tumors of the bladder can usually be made by the use of the cystoscope, an instrument permitting an inspection of the interior of the bladder. Cancer of the bladder is usually accompanied by severe pains. Surgical treatment is alone available for tumors of the bladder. The non-malignant tumors may exist for many years and give rise to but slight inconvenience. The malignant tumors, chiefly cancer, are fatal within a few years unless diagnosed early and properly treated.

Cystitis is the name given to an inflammation of the lining membrane of the bladder. The mucous membrane of the bladder is highly resistant to infection, hence a cystitis here is frequently something more than a mere infection of the bladder itself. The chief cause for a cystitis is gonorrhea. This is to be regarded as an extension from the urethra. It is rare save in the predisposed bladder, hence certain authors speak of the rarity of a gonorrheal cystitis. While this may be a technical distinction made by the specialist, for practical purposes, a gonorrheal cystitis is a cystitis. The chief early symptom of a cystitis is the increased frequency of the desire to urinate. This may be slight or it may consist of a persistent painful urge which accomplishes with agony the passage of but a few drops of urine. Pain may be slight, save in the more marked cases, when it may be severe and persistent. It is felt just behind the pubic bone, or in the perineum, shooting down the thighs, to the testicles, and down the penis. Pain in the neck of the bladder is specially referred to the perineum and the end of the penis. In most cases there is some fever, and constipation is the rule. Pus is found in the urine which latter is frequently alkaline in reaction.

An acute cystitis may persist for from two to three weeks. Such is its usual course, but under unfavorable conditions it may persist much longer or even progress to a chronic cystitis which may continue for months or years.

Stone in the bladder, stone in the kidneys, foreign bodies in the bladder, give rise to chronic forms of cystitis, in which the symptoms just enumerated may be added to by the presence of blood in the urine; pus, shreds of mucus and other forms of bladder detritus are to be expected.

There is a type of true cystitis — an interstitial parenchymatous inflammation of the bladder wall — which is more severe than the catarrhal variety of cystitis just described. It often results in localized abscess formation of this structure.

The treatment of cystitis requires very skilled advice and careful technique. Extension of the infection — usually gonorrheal — to the kidney results in serious kidney disease — pus kidney. All operative procedures — principally catheterization (prostatic disease in older men being one of the chief disturbing necessities) — should be done with the strictest aseptic precautions. All catheters should be cleansed, boiled and used before being soiled by any contacts. Rest in bed, a quieting suppository and irrigation are the chief means at hand for the actual treatment. Hip baths, hot applications are grateful, increased water drinking tends to make the urine less irritating. Citrates, as in fruit juices or chemical compounds, are advisable. The diet should be regulated. In the mild cases irrigation may not be needed, but in persistent pus states and foul urine, irrigation is desirable. The use of special drugs may be indicated by the trained physician.

Stone in the bladder is a particularly important affection of this viscus. These stones may be composed of uric acid, oxalate of lime or of phosphates. The symptoms are pain, frequency of micturition, bleeding. The pain is apt to be colicky in nature, severe at the end of urination and referred down the penis or to the perineum or rectum. The bleeding is apt to be intermittent and often appears after much jolting. It may be a thin, blood-colored urine, or drops of clear blood may be expelled at the close of micturition. The treatment is by crushing by appropriate instruments. The X-ray is of considerable value in the diagnosis.

SMITH ELY JELLIFFE.

BLADDER-NUT (*Staphylea*), the type genus of the family *Staphyleaceæ*, consisting of about eight species of ornamental shrubs or small trees, natives of the northern hemisphere. The common bladder-nut (*S. pinnata*) a native of Europe and Asia, which attains a height of 15 feet, and is often planted for ornament, bears panicles of whitish flowers in late spring. The American bladder-nut (*S. trifolia*), which ranges from Quebec to Minnesota and southward to South Carolina and Missouri, bears nodding panicles or umbel-like racemes of white flowers and, like several of the other species, is used in shrubberies. The wood of the two species mentioned is white and hard and is used in turning. The flower buds are pickled like capers and the seeds sometimes eaten. The common name is suggested by the inflated capsule and the hard shell of the seed; the generic name by the resemblance of the raceme to a bunch of grapes, the *staphyle* of the Greek language.

BLADDERWORM, *Cysticercus* or immature stage of the tapeworm, the hydatid of physicians. See TAPEWORM.

BLADDERWORT, *Utricularia*, a genus of about 200 species of largely aquatic herbs of the family *Pinguiculaceæ* widely distributed throughout the world, but especially abundant in the tropics. The aquatic species are remarkable for the little, sometimes valved, bladders which entrap and digest aquatic insects and other water animals. The bladders, which are at first filled with water, become inflated with air at flowering time so that the flower, instead of being submerged like the rest of the plant, is raised above the surface until after blossoming, when water again fills the bladders, the plants sinking to the bottom, where the seeds are ripened. These aquatic species, of which about a dozen with yellow or blue flowers are natives of the United States, are common in ditches, ponds and marshes throughout the world. They are sometimes cultivated in aquaria more as curiosities than for any intrinsic beauty. In the marsh species the bladders are less effective and numerous than in the pond species, and in the terrestrial kinds they are small, abortive and useless. These last have leaves of ordinary forms and are often tuberous, where members of the first group have much dissected foliage like other pond plants and are rootless. Some of the tropical species are showy and are cultivated in hothouses like orchids, with some of which they compare in beauty. Consult Bailey, ‘Cyclopedia of Standard Horticulture’ (1914).

BLADEN, Frank Murcott, Australian author: b. Hanley, England, 23 Dec. 1858. He was graduated from Sidney University in 1858, winning the University gold medal for English verse and the Lord Rosebery medal for English prose and graduating in law. In 1895 he became head of the Public Library of the state of New South Wales, a position he held for 10 years, when he was appointed chief state librarian. He has written exhaustively and learnedly on Australian history on which he is a recognized authority; and he is the editor of the work ‘Historical Records’ (7 vols.), which forms a complete record of the settlement and early history of Australia (1762–1811). He represented the Australian Commonwealth at the International Conference of Historians held at Rome in 1902. Among his published works are ‘China’ (poem); ‘The Growth and Development of the Australian Colonies and their Relation to the Mother Country’; ‘European Archives’; ‘Peopling Australia’; ‘Historical Notes,’ and ‘The Early Governors’ (of Australia).

BLADENSBURG, Maryland, small town in Prince George County, on the east branch of the Potomac, about six miles east from Washington, with a population in 1910 of 500. At the bridge over the Potomac west of Bladensburg, the battle with the English, which preceded the capture of Washington, took place toward the latter part of the War of 1812. General Ross and Admiral Cockburn, with about 5,000 men, appeared in Chesapeake Bay to attack Washington. The American forces fell back to Bladensburg and awaited the British. The Americans numbered about 7,000, but were scattered and untrained. On 24 Aug. 1814, the British advanced to the attack. The American artillery held them in check for a time, but the troops pushed forward. The Americans fled in wild disorder; the confusion spread and soon General Winder, the American commander, gave orders for a general retreat. The American loss was 76 men; the British more than 500 killed and wounded. Bladensburg is famous in American history as the site of the duelling grounds where many famous duels growing out of quarrels in Washington were fought, as that in which Barron killed Decatur in 1820.

BLADENSBURG, Battle of. See WASHINGTON, D. C., CAMPAIGN AGAINST AND BURNING OF.

BLAGOVESHTCHENSK, blä-gö-vyĕsh'-chĕnsk, Russia, town on the Manchurian frontier of eastern Siberia, capital of the province of the Amoor, on the river Amoor, where it receives the Zeya. Founded as a military post in 1856, it is now an important place, the seat of a bishopric, with flour mills, iron works and shipbuilding, and the centre of important gold fields. In July 1900, the Chinese made an ineffective assault on the town; in revenge some Chinese residents were massacred, and, under circumstances of great barbarity, thousands of Chinese were ordered across the river frontier and many of them drowned. Pop. 40,399.

BLAGUE, bläg (French), humbug, brag, intended to mystify; its earlier meaning, a tobacco pouch. Littré traces the word to the Gaelic blagh, to inflate, to blow.

BLAIKIE, William Garden, Scotch clergyman: b. Aberdeen, 1820; d. 11 June 1899. He was graduated at the University of Aberdeen; ordained a minister of the Established Church in 1842; joined the Free Church in 1843, and was appointed professor of apologetics and pastoral theology in New College, Edinburgh, 1868–97. He took a leading part in the formation of the Alliance of the Reformed Churches, and established a reputation as an editor of religious periodicals. His writings include ‘Bible History in Connection with General History’ (1859); ‘Bible Geography’ (1860); ‘Better Days for Working People’ (1863); ‘Glimpses of the Inner Life of David Livingstone’ (1880); ‘Public Ministry and Pastoral Methods of Our Lord’ (1883); ‘Leaders in Modern Philanthropy’ (1884), etc.

BLAINE, Ephraim, American soldier: d. Carlisle, Pa., 1808. He entered the army as a colonel at the commencement of the Revolutionary War, and was subsequently made commissary-general. His services were gallant and patriotic. He was with Washington in many of the most trying scenes of the Revolution, and enjoyed the confidence of his chief to the fullest extent. During the «dark winter» at Valley Forge, the preservation of the American army from starvation was in a great degree owing to the exertions and sacrifices of Colonel Blaine. James Gillespie Blaine, the well-known statesman, was his grandson.

BLAINE, James Gillespie, American statesman: b. West Brownsville, Pa., south of Pittsburgh, 31 Jan. 1830; d. Washington, D. C., 27 Jan. 1893. His father was a Presbyterian of Scotch-Irish blood; his mother was a Catholic. He was a lad of quick action and good memory, who excelled in spelling matches and debates. He began the study of law but he never practised. For about two years he was professor in the Western Military Institute at Georgetown, Ky., and there he acquired a taste for political life. We next get a glimpse of him in Philadelphia as a teacher and contributor to the *Daily Inquirer* of that city. As a youth of 21 he became part owner of the *Kenebec Journal,* published in Augusta, Me. His work on this journal gained him a vast influence and he quickly made his mark in Maine politics. The governor sent him on a mission to examine the prisons and penitentiaries of other States, with a view to the improvement of those of Maine; and he was a delegate to the Republican convention at Philadelphia which nominated Frémont. His renown as an orator and as a party organizer was now widespread. In 1858 he was elected a member of the Maine Legislature, and soon became speaker of the House. In 1862 he was returned to Congress where his mastery of parliamentary law and his eloquence in debate soon won him distinction. The Civil War was still raging, but fortune was beginning to declare unmistakably for the North. Blaine's name is not conspicuously written in any history of the war, but he was among the foremost in directing the policy and details of Reconstruction. Blaine was a born member of Congress. His vigor, acumen, readiness, and unfailing energy marked him out as a party leader. He was elected speaker of the House of Representatives in 1869 — an office which he held till 1874 — a period of almost unequalled length. On all hands it was admitted that in that difficult position he displayed rare talents and judgment. Since Henry Clay there had been no more successful speaker. His history for 10 years is really the history of Congress. He served on all the principal committees. He spoke often, and always with effect. Never was his ability questioned; unfortunately his integrity was assailed on an occasion which cannot be passed over in any truthful biographical notice of Mr. Blaine. In 1876 an investigation by the Committee of the House of Representatives brought to light certain letters — famous «Mulligan Letters,» written by him in 1869, when he was speaker of the House. We need not set out the text of these much controverted letters, or revive a controversy now forgotten. It is enough to say that they contained expressions open to various interpretations and which demanded explanation. The genuineness of these letters was not disputed, but over their signification all politicians, the press and the general public were greatly divided. It was urged by Mr. Blaine's friends that the matter was absurdly magnified and distorted by those who resented his free, fearless speech. On 5 June 1876 Mr. Blaine read the letters before the House, making explanations of them one by one. He defeated his opponents in the debate immediately following, and to all appearances clearly exonerated himself of all wrong-doing. But the effect throughout the land was immense and even in his own party many influential members lost their faith in him. This was made manifest when his candidacy was put forward at the Convention of 1876, where, though he held the field for several ballots, he was in the end defeated by Rutherford Hayes of Ohio, by only a small majority. Senator Morrill of Maine becoming Secretary of the Treasury, Mr. Blane was chosen senator for the unexpired term, and the following winter for the full term. He opposed the electoral commission on the ground that Congress was conferring powers beyond its own; opposed Hayes' withdrawal of the troops that upheld the carpet-bag governments; opposed the Bland Silver Bill and the adoption of the gold standard alike, believing bimetallism feasible and preferable; advocated ship subsidies, and rigid prohibition of Chinese immigration. In 1880 the attempt at a third term for Grant was defeated by the Blaine forces, who gave him 284 votes on the first ballot; but after six days and 35 ballots, seeing that Blaine could not be nominated, united with the Sherman party to nominate Garfield, by 399 to Grant's 306. Blaine became Secretary of State, and in his short tenure he planned a Pan-American Congress, attempted mediation between victorious Chile and crushed Peru, and attempted to induce England to consent to a modification of the Clayton-Bulwer Treaty. The assassination of Garfield, and the accession of Arthur, the lieutenant of Blaine's mortal enemy, Roscoe Conkling, made his place untenable and he retired from President Arthur's cabinet in December 1881. Then came what for Mr. Blaine was a period of inactivity and of seclusion in his home at Augusta, varied by writing a book in two large volumes entitled 'Twenty Years In Congress,' a work of considerable value, issuing the first volume in 1884, in time to do good work conciliating support for the next election. Again the presidential campaign came round, and this time Blaine was nominated at the Chicago Convention. Into the contest, one of the bitterest in United States history, he threw himself with his usual energy. At the election the Independent Republicans deserted Blaine and voted for Cleveland. Blaine was again doomed to disappointment. He missed that which had been the aspiration of his political life. The chief reasons for his defeat were the hostility of Conkling and his followers, the defection of the Independent Republicans, and the fact that, although Blaine was well disposed toward his Catholic fellow countrymen, he had allowed the Rev. Samuel

D. Burchard to style the Democratic party "the party of Rum, Romanism, and Rebellion." After his defeat he issued the second volume of his work (1886), and the next year a volume entired ‘Political Discussions.’ Again a candidate in 1888, he was obliged to withdraw in favor of Harrison, and was made Secretary of State once more; he resumed his Pan-American policy, made a futile attempt to induce Great Britain to join in preserving the seals from extermination, and favored a reciprocity commercial policy which made many of his old opponents draw toward him. He resigned in 1892, in hope of securing the next Republican nomination, but found it out of the question. He died early the following year, of Bright's disease. In the view of Mr. Blaine's many friends he had no rival or second among his countrymen. They spoke, and no doubt with perfect truth, of his generosity in private life; they scouted all suspicion of his integrity, in their eyes he was "the peerless statesman," uniting the best qualities of Henry Clay, Webster, Sumner and Henry Wilson. Still, in spite of the warmth and multitude of his friends, he had to endure the distrust — perhaps exaggerated and unjust, but deep-rooted and lasting — of a large number of his countrymen, who persisted in viewing him as the representative of a type of politician with which they would fain forever have done. Abroad his policy was not always thought well of; and his most searching critics, his relentless enemies, were certain members, and not the least honorable or powerful, of the Republican party. Consult the biography by his kinswoman, Gail Hamilton (Norwich 1895); also the biography by Stanwood (Boston 1905); id., ‘History of the Presidency’ (ib., 1898); Conwell, ‘Life and Public Service of James G. Blaine’ (Muskegon 1884); Crawford, ‘James G. Blaine’ (Philadelphia 1893); Peck, Harry Thurston, ‘Twenty Years of the Republic’ (New York 1906–13); id., ‘American Party Leaders’ (ib., 1914); Varigny, ‘Les Etats — Unis’ (Paris 1892).

BLAINVILLE, blȧṅ′-vē′, **Henri Marie Ducrotay de,** French naturalist: b. Arques, near Dieppe, 1777; d. 1 May 1850. He studied medicine and the allied sciences at Paris, and was for a time assistant to Cuvier, whose influence helped to place him in the chair of anatomy and zoology in the Faculty of Sciences at Paris in 1812. Unfortunately misunderstandings soon arose between the master and his comparatively youthful rival, and ultimately terminated in open rupture. In 1825 Blainville was admitted to the Academy of Sciences, and in 1829 the department of mollusca, zoophytes and worms in the Museum of Natural History was committed to Blainville. In 1832 he became the successor of Cuvier in the chair of comparative anatomy in the same establishment. The following are among his more important works: ‘De l'organisation des animaux ou Principes d'anatomie comparée’ (1822); ‘Manuel de malacologie et de conchyliologie’ (1825); ‘Cours de physiologie générale’ (1829–32); ‘Manuel d'actinologie’ (1834); ‘Sur les principes de la zooclassie’ (1847), and above all, the gigantic but unhappily unfinished work entitled ‘Ostéographie ou description iconographique comparée’ (1839–50).

BLAIR, Andrew Alexander, American chemist: b. Kentucky, 20 Sept. 1848. He graduated at the United States Naval Academy, 1866; was chief chemist to the United States commission to test iron, steel and other metals, 1875–78, and to the United States Geological Survey and 10th census, 1879–81. Since then he has been engaged in general practice. Besides reports to the government and contributions to scientific journals he has published ‘The Chemical Analysis of Iron: Complete Account of all the Best-Known Methods for the Analysis of Iron, Steel, etc.’ (Philadelphia 1888), which has passed through eight editions. He is a member of the American Philosophical Society, the American Chemical Society, the Institute of Mining Engineers, Society of Chemical Industry (Great Britain) and fellow of the American Association for the Advancement of Science.

BLAIR, Andrew George, Canadian statesman: b. Fredericton, 7 March 1844; d. 1907. He was educated at the College School, Fredericton, and called to the bar in 1866. He entered the New Brunswick legislature in 1878, becoming leader of the opposition in 1879. He was Prime Minister of the province 1883–96, and carried through a number of important reforms. He joined the Laurier ministry in 1896 as minister of railways and canals, and became in 1904 first Dominion railway commissioner, retiring in the same year.

BLAIR, Austin, American lawyer: b. Caroline, N. Y., 8 Feb. 1818; d. Jackson, Mich., 6 Aug. 1894. He was graduated at Union College in 1839; studied law in Oswego, N. Y., was admitted to the bar in 1841 and removed to Eaton Rapids, Mich., and was elected county clerk. In 1844 he removed to Jackson, Mich.: was elected to the legislature in 1846; became conspicuous in the convention which established the Republican party in Michigan, and was elected governor of Michigan in 1860. He was a member of the convention in 1860 that nominated Abraham Lincoln. Blair was re-elected governor in 1862; was the first to be termed "War Governor." In 1866 he was elected to Congress, was re-elected to the 41st and 42d Congresses, and in the latter, while chairman of the committee on claims opposed the Republican administration. He supported Greeley for the presidency in 1872 and was chosen regent of the State University in 1883, retaining the position until 1890.

BLAIR, Francis Preston, American journalist and politician: b. Abington, Va., 12 April 1791; d. Silver Spring, Md., 18 Oct. 1876. In early life he was a Jacksonian Democrat. He edited the Washington *Globe* from 1830 to 1845. Through his anti-slavery sentiments he became one of the founders of the Republican party, but in later years returned to the Democratic faith.

BLAIR, Francis Preston, Jr., American soldier and statesman (son of the preceding): b. Lexington, Ky., 19 Feb. 1821; d. Saint Louis, Mo., 5 July 1875. He was a representative in Congress from Missouri (1857–59 and 1861–63); became a major-general in the Union army in the Civil War, taking an active part in the Vicksburg campaign and Sherman's march to the sea; was an unsuccessful Democratic candidate for Vice-President in 1868 and United States senator (1870–73).

BLAIR, Henry William, American legislator: b. Campton, N. H., 6 Dec. 1834; d. Washington, D. C., 14 March 1920. He was admitted to the bar in 1859; served through the Civil War, becoming lieutenant-colonel of the 15th New Hampshire Volunteers, and was twice wounded. After serving in both branches of the State legislature he was a member of Congress (1875–79 and 1893–95). and United States senator (1879–89). He was the author of what is known as the «Blair Common School Bill,» designed to distribute a certain amount of Federal money for educational purposes among the various States in proportion to the number of illiterates. He was a strong opponent of Chinese immigration, and when he was appointed and confirmed United States Minister to China that government's objection to receiving him ended in his withdrawal. He was an active worker in the cause of temperance and other reforms. He published ‹The Temperance Movement.›

BLAIR, Hugh, Scottish divine: b. Edinburgh, 7 April 1718; d. 27 Dec. 1800. He commenced his academic career at Edinburgh University in 1730. In 1741 he was licensed as a preacher, and the following year was ordained to the parish of Collessie, Fife, but a few months after he was elected to the second charge of the Canongate, Edinburgh. In 1754 he received one of the city charges, that of Lady Yester's Church, and in 1758 one of the charges of the High Church. In 1759 he commenced a course of lectures to students upon the principles of literary composition; and in 1762 he was made professor of rhetoric and *belles-lettres* in the University of Edinburgh, being the first that ever occupied this chair. He continued the course till 1783, when he published his lectures, which received very high praise. In 1763 he published a dissertation on the ‹Poems of Ossian,› in the authenticity of which he firmly believed. It was not till 1777 that he could be prevailed upon to offer to the world any of those sermons with which he had so long delighted a private congregation. One of the sermons having been sent by Strahan, the King's printer, to Dr. Johnson for his opinion, Strahan received from him the following characteristic note: «I have read over Dr. Blair's first sermon with more than approbation; to say it is good is to say too little.» Strahan thereupon agreed to purchase the volume, with Mr. Cadell, for $500. The sale was so rapid and extensive, and the approbation of the public so high, that the proprietors voluntarily doubled the stipulated price. The volume speedily fell under the attention of George III, and by royal mandate a pension of $1,000 a year was bestowed on Dr. Blair. During the subsequent part of his life Dr. Blair published three other volumes of sermons; and it might safely be said that each successive publication only tended to deepen the impression produced by the first.

BLAIR, James, American clergyman and educator: b. Scotland 1656; d. Williamsburg, Va., 1 Aug. 1743. In 1685 he was sent as a missionary to Virginia by Dr. Compton, bishop of London. There he secured the confidence of the planters, and proved himself far in advance of his contemporaries on the question of slavery. In 1689 Sir Francis Nicholson appointed him «commissary,» the highest ecclesiastical office in the colony. This office gave him a seat in the council of the colonial government; he presided over the trials of clergymen, and pronounced sentence upon conviction of crimes or misdemeanors. His great desire was to see a college established in the colony. The assembly and governor warmly sympathized with his project; he went to England and laid his plan before William and Mary; and on 14 Feb. 1692, a charter for the college was granted, the bishop of London being appointed chancellor and Blair president, and the institution named «William and Mary.» Its opening was repeatedly delayed, and Blair did not enter on his duties as president until 1729, but his enthusiasm never wavered, and his efforts were finally crowned with success. He left his library to the college. He wrote ‹Our Saviour's Divine Sermon on the Mount› (London 1722, 4 vols.; 3d ed., 1740), a work highly considered throughout the 18th century.

BLAIR, John, Scottish chronologist and geographer: d. 24 June 1782. He went to London about the middle of the 18th century. In 1754 the publication of a work in folio, entitled ‹The Chronology and History of the World from the Creation to 1753 A.D.,› gained him great reputation. In 1757 was appointed chaplain to the Princess Dowager of Wales, and mathematical tutor to the Duke of York, whom he accompanied, in 1763, on a tour of the Continent, having already received several ecclesiastical preferments. On his return to England he published, in 1768, a new edition of his ‹Chronological Tables,› with 14 maps of ancient and modern geography annexed.

BLAIR, John Insley, American capitalist and philanthropist: b. Belvidere, N. J., 22 Aug. 1802; d. 2 Dec. 1899. In early life he was employed in a country store at Hope, N. J. He settled in Blairstown and acquired an interest in the Oxford Iron Furnace, and became an associate in the pioneer attempt to manufacture iron with anthracite coal, in 1846; subsequently becoming the individual owner of more miles of railroad property than any other man in the world. With the Scranton brothers he constructed the road now known as the Delaware, Lackawanna & Western. He acquired a very large fortune; loaned the Federal government more than $1,000,000 in the early part of the Civil War; built and endowed at a cost of more than $600,000 the Presbyterian Academy in Blairstown, N. J.; rebuilt Grinnell College, Iowa; erected Blair Hall and made other gifts to Princeton University; was equally liberal to Lafayette College; and had erected more than 100 churches in different parts of the West, besides laying out many towns and villages on the lines of his numerous railroads.

BLAIR, Montgomery, American lawyer: b. Franklin County, Ky., 10 May 1813; d. Silver Springs, Md., 27 July 1883. He was graduated at the United States Military Academy in 1835; resigned from the army, 1836; was admitted to the bar, 1839, and began practice in Saint Louis. He was judge of the Court of Common Pleas, 1843–49; removed to Maryland in 1852; was

United States solicitor in the Court of Claims, 1855–58. He acted as one of the counsel in the widely known Dred Scott case. He changed from the Democratic to the Republican party on the repeal of the Missouri Compromise, and was president of the Maryland Republican Convention in 1861. In 1861–64 he was Postmaster-General under Lincoln. During his administration the money order system was inaugurated, and the free delivery of mails in cities and the sorting of mails on postal railroad cars introduced. In 1876–77 he acted with the Democratic party in opposing Hayes' title to the office of President.

BLAIR, Robert, Scotch clergyman and poet: b. Edinburgh 1699; d. Athelstaneford 1746. He was ordained, in 1731, minister of Athelstaneford, in East Lothian, where he spent the remainder of his life. He was a man of learning and of elegant taste and manners, and assiduous in discharging the duties of his clerical functions. His best-known poem, ‹The Grave,› was chiefly composed before his ordination. It was first printed in 1743, and is now esteemed one of the standard classics of English poetical literature, in which rank it will probably remain longer than many works of greater contemporary or even present fame.

BLAIR, Neb., city, county-seat of Washington County, 25 miles northwest of Omaha, on the Chicago & Northwestern and the Chicago, Saint Paul, Minneapolis & Omaha railroads. Since 1914 Blair has a commission form of government. It is the seat of Dana College and the Crowell Memorial Home for retired Methodist ministers. It has municipal waterworks, canning, cider, vinegar, pickle and other domestic industries. Pop. 2,584.

BLAIRSVILLE, Pa., borough of Indiana County, 50 miles east of Pittsburgh, on the Conemaugh River, and on the Pennsylvania Railroad. It has a public library and is the seat of Blairsville College (Presbyterian). Its industries comprise foundries, machine shops, railroad repair shops, plate glass and lumber manufactories and enameling works. The borough was settled about 1818 and was incorporated a borough in 1825. It is governed by a mayor and council, the former being chosen for a term of three years. The borough owns the waterworks. Pop. (1920) 4,391.

BLAKE, Edward, Canadian statesman: b. Cairngorm, Ontario, 13 Oct. 1833; d. Toronto, 1 March 1912. He was educated at Upper Canada College and Toronto University; was called to the bar in 1859 and engaged in practice in Toronto. In 1867 he won seats in both the provincial and Federal houses; was leader of the opposition in the provincial legislature 1870–71, and Premier of Ontario 1871–72. When a law was passed prohibiting dual representation he elected to sit in the Federal house and resigned his premiership; was Minister of Justice in MacKenzie's administration 1875–77; president of the Council 1877–78; and leader of the opposition 1880–87. The leader of the equity bar of Ontario and perhaps the most brilliant intellect that has appeared in Canadian politics, his rise had been extremely rapid, and his onslaughts on the Macdonald administration in connection with the Pacific scandal told strongly in the country and paved the way for the Liberal triumph in 1873. But he was somewhat cold and distant in his manner, and lacked the personal magnetism that counts for so much in public life, and he suffered from indifferent health. After he had retired from Canadian politics he represented the Irish constituency of South Longford in the British House of Commons as a Nationalist member, but failed there to maintain the great reputation he had earned in Canada. He retired from public life in 1907.

BLAKE, Eli Whitney, American inventor: b. Westboro, Mass., 27 Jan. 1795; d. New Haven, 17 Aug. 1886. He was graduated at Yale University in 1816, and began business with his uncle, Eli Whitney, in the manufacture of firearms. In 1834 he founded, near New Haven, Conn., the pioneer factory for the manufacture of domestic hardware. In 1857 he invented the widely-known stone- and ore-crusher called the Blake crusher, which introduced a new era in road-making and mining industries, and is used throughout the world. He wrote many scientific papers, including the well-known ‹Original Solutions of Several Problems in Aerodynamics› (1882).

BLAKE, Francis, American inventor: b. Needham, Mass., 25 Dec. 1850; d. 1913. He served for 13 years on the United States Coast Survey (1866–79), part of the time engaged in field work and its reduction to determine differences of longitude between the observatories at Greenwich, Paris, Cambridge and Washington. Having devoted himself to the study of experimental physics, in 1878 he invented the famous Blake transmitter, which is the telephonic transmitter now most widely used throughout the world. He has also patented other electrical devices.

BLAKE, John Laurie, American clergyman and author: b. Northwood, N. H., 21 Dec. 1788; d. Orange, N. J., 6 July 1857. He was educated at Phillips Exeter Academy and at Brown University. He first entered the Congregational ministry, but in a short time became an Episcopalian and was ordained in that Church in 1815. He settled in Pawtucket, and later in Hopkinton, N. H., and in 1822 removed to Boston. He continued rector of Saint Matthew's Church, Boston, till 1830, then devoted himself to literary work. He published several textbooks, prepared for his own classes, and was editor of the *Gospel Advocate*. His greatest work, a ‹Biographical Dictionary,› was first published in 1835. He also wrote a number of small books for children's libraries, including ‹Book of Nature Laid Open,› ‹Wonders of the Earth› and ‹Wonders of Art.›

BLAKE, MRS. **Lillie** (DEVEREUX) **Umstead**, American advocate of woman's rights and novelist: b. Raleigh, N. C., 12 Aug. 1835; d. 30 Dec. 1913. Her first husband, Frank G. Quay Umstead, died in 1859; she married Grenfill Blake in 1866, who died in 1896. She wrote and spoke much on woman suffrage, and her novels bear on this theme. She published ‹Southwold› (1859); ‹Rockford› (1863); ‹Fettered for Life› (new ed., 1885); ‹Woman's Place To-Day› (1883), a reply to Dr. Morgan Dix's ‹Lenten Lectures on Women,› which attracted attention; ‹A Daring Experiment› (1894), etc. She was one of the promoters of the movement to found Barnard College; was president of the New York State Women's Suffrage Association from 1879 to 1890 and of the New York City Woman's Suffrage League, 1886–1900. She was active in promoting legislation permitting women to vote in school elections in New York State, and proposed the law providing for matrons in the police stations of New York, and the law requiring merchants to provide seats for saleswomen. In 1900 she was president of the Civic and Equality Union

BLAKE, Mary Elizabeth (McGrath), American poet and writer: b. Dungarven, Ireland, 1 Sept. 1840; d. Boston, Mass., 27 Feb. 1907. In verse she has written 'Poems' (1882); 'Youth in Twelve Centuries' (1886), etc. Of her travels may be named 'On the Wing' (1883); 'A Summer Holiday.'

BLAKE, Robert, British admiral: b. Bridgewater, Somerset, August 1599; d. 17 Aug. 1657. After attending the grammar school of his native place he was sent to Wadham College, Oxford, where he took the degree of B.A. in 1617. On his return to Bridgewater he lived quietly on the fortune left him by his father, and was led to embrace the principles of the Puritans, by whose interest he was elected member for Bridgewater in the Parliament of 1640, but lost his seat on the dissolution. He served in the Parliamentary forces during the Civil War as lieutenant-colonel; he held Lyme against the Royalists in 1643, and captured and held Taunton, 1644–45. In 1649 he was sent to command the fleet in conjunction with Colonels Deane and Popham, and thus commenced his naval career. He immediately sailed to Kinsale in quest of Prince Rupert, whom he attempted to block up in that port. The Prince escaped to Lisbon, where Blake followed him; and being refused permission to attack him in the Tagus by the King of Portugal, he took several rich prizes from the Portuguese (against whom the Parliament declared war), and followed Rupert to Malaga, where, without asking permission of Spain, he attacked him and nearly destroyed the whole of his fleet. On his return to England he was made warden of the Cinque Ports, and soon after reduced the islands of Scilly and Guernsey. In 1651 he became a member of the Council of State. In 1652 he was made sole admiral, and on the 19th of May was attacked in the Downs by Van Tromp with a fleet of 45 sail, the force of Blake amounting only to 23. He fought so pertinaciously, however, against the heavy odds, that Van Tromp was obliged to retreat. He then continued his cruise, took a number of Dutch merchantmen, and after several partial actions drove the enemy off and returned to the Downs. On 29 November he was again attacked by Van Tromp, whose fleet was now increased to 80 sail. Blake engaged this vast force with a very inferior number and an unfavorable wind; but, after every possible exertion, was obliged to retreat into the Thames. After this engagement, according to a story which is entirely unsupported by contemporary evidence, Van Tromp was so much elated that he sailed through the Channel with a broom at his masthead, to signify that he had swept the sea of British ships. In the February following, Blake, having with great diligence repaired his fleet, put to sea with 60 sail, and soon after met the Dutch admiral, who had 70 sail and 300 merchantmen under convoy. During three days a furious running fight up the Channel was maintained with obstinate valor on both sides, the result of which was the loss of 11 men-of-war and 30 merchant ships by the Dutch, while that of the English was only one man-of-war. It was in April of this year that Cromwell assumed the protectorate — a change of status that did not affect Blake's loyalty. «It is not for us,» said Blake to his officers, «to mind state affairs, but to keep the foreigners from fooling us.» On 3 June he again engaged Van Tromp with dubious success; but, renewing the action the next day, he forced the Dutch to retire with a considerable loss in ships and men. On his return he was received by Cromwell with great respect, and was elected member for Bridgewater in the new Parliament. Aware of his affection for a republican government, the Protector was not displeased at having occasion to send him with a strong fleet, to enforce a due respect to the British flag in the Mediterranean. He sailed first to Algiers, which submitted, and then demolished the castles of Goletta and Porto Ferino, at Tunis, because the Dey refused to deliver up the British captives. A squadron of his ships also blocked up Cadiz and intercepted a Spanish fleet from the river Plate. Being now very sick, he resolved to do one more service to his country before his death, and sailed with 24 ships to Santa Cruz, in Teneriffe, and, notwithstanding the strength of the place, burned the ships of another Spanish Plate fleet which had taken shelter there, and by a fortunate change of wind came out without loss. His brother having failed in some part of duty during this service, he immediately removed him from his command. Finding his disorder making rapid progress he then sailed for England, and expired while the fleet was entering Plymouth Sound. His body was honored with a magnificent public funeral, and interred in Westminster Abbey, whence it was, with pitiful spite, removed at the Restoration and buried in Saint Margaret's churchyard. So disinterested was Blake that, after all his rich captures and high posts, he scarcely left behind him $2,500 of acquired property, freely sharing all with his friends and seamen, into whom he infused that intrepidity and spirit of enterprise by which the British navy has been ever since so highly distinguished. Consult 'Lives' by Dixon (1852), S. Johnson (1792) and Stevenson (1910); and Gardiner's 'History of the Commonwealth and Protectorate' (1894–1900).

BLAKE, William, English poet, painter and engraver: b. London, 28 Nov. 1757; d. 12 Aug. 1857. At the age of 10 he was sent to a drawing-school, and four years later he was apprenticed for seven years to the engraver James Basire, for whom he drew from the monuments in the older London churches and Westminster Abbey. In 1778 he studied in the Royal Academy, and about this time he began to engrave for the booksellers, among his chief productions being plates after Stothard for the *Novelists' Magazine*. To the first exhibition of the Royal Academy he sent a drawing entitled 'The Death of Earl Godwin.' He married in 1782 Catherine Boucher, the daughter of a market gardener, and for the three years 1784–87 carried on a printseller's shop in partnership with another engraver. From his earliest years Blake was a mystic. He believed that all things exist in the human imagination alone, and had a wonderful power of imaginative vision which enabled him to see angels in trees and in fields, great men of past times, etc. His ‘Songs of Innocence,’ verse and designs (1789), and the companion ‘Songs of Experience’ (1794), were reproduced by himself and his wife by a process which he believed to have been revealed to him in a dream by a dead brother. Between 1793 and 1800 he produced a large number of designs, among them 537 illustrations for Young's ‘Night Thoughts.’ In 1800 he became acquainted, through Flaxman, with the poet William Hayley, who gave him artistic commissions, and for three years he lived in his neighborhood at Felpham. He next produced the designs to Blair's ‘Grave’ (engraved by Schiavonetti), which in imaginative power stand in the forefront of his artistic work. In 1808 he sent to the Royal Academy the pictures ‘Christ in the Sepulchre Guarded by Angels’ and ‘Jacob's Dream,’ the last pictures he exhibited there. From 1818 till his death he had a staunch friend and patron in the painter John Linnell. It was about this time that he executed the series of pencil drawings known as ‘Spiritual Portraits.’ The highly prized wood-cuts to Thornton's ‘Virgil’ were executed in 1820, and in 1825 he produced for Linnell his wonderful ‘Inventions to the Book of Job,’ which, containing 22 engravings, 21 original designs in colors, with the original colored drawings by the artist (the property of the Earl of Crewe), sold in London, in 1903, for $28,000. He also executed a series of engravings and designs for the ‘Divina Commedia.’ At the sale just mentioned 12 drawings in colors for ‘L'Allegro’ and ‘Il Penseroso’ brought $9,800, and the original colored issue of ‘America, a Prophecy,’ sold for $1,475. Among Blake's other writings are ‘Poetical Sketches’ (1783); ‘Gates of Paradise’ (1793); ‘Prophetic Books,’ sadly incoherent, but with splendid designs (1793–1804). The only complete edition of his works is that of E. J. Ellis and W. B. Yates (3 vols., 1893). (See SONGS OF INNOCENCE AND EXPERIENCE). Consult Gilchrist's ‘Life’ (1863); Selincourt, ‘William Blake’ (1909); ‘Works’ by Swinburne (1868), and Story (1893); Ellis, ‘The Real Blake’ (1907); Yeats, W. B., ‘Essays of Good and Evil’ (1903).

BLAKE, William Hume, Canadian jurist: b. Kiltegan, county Wicklow, 1809; d. Toronto 1870. He was educated at Trinity College, Dublin, studied medicine and afterward theology with a view to taking orders in the Anglican Church, emigrated to Canada in 1832 and settled on a farm in Middlesex County. He was called to the bar of Upper Canada in 1838, took an active part in the reform movement, was returned to the Canadian assembly in 1847 as member for East York, was solicitor-general for Canada West, 1848–49, and chancellor of Upper Canada, 1850–62. He was the father of Edward Blake (q.v.).

BLAKE, William Phipps, American mineralogist: b. New York, 1 June 1826. Graduating at the Sheffield Scientific School in 1852, he joined the United States Pacific Railroad exploring expedition (1853) as mineralogist and geologist. In 1861 he became mining engineer for the Japanese government, and with R. Pumpelly organized the first school of science in Japan. As an expert in his specialty he was connected in important capacities with the Paris Exposition of 1867, the Vienna Exposition (1873), United States Centennial Exhibition (1876), Paris Universal Exposition (1878), and drafted the system of classification of United States ores and minerals at the Columbian Exposition (1893). He has conducted important explorations in Alaska, California and Nevada and the chief mining districts of the United States, frequently publishing his results in valuable reports and scientific papers. Publications: ‘Silver Ores and Silver Mines’ (1861); ‘California Minerals’ (1863); ‘Production of the Precious Metals’ (1867); ‘Iron and Steel’ (1873); ‘Ceramic Art and Glass’ (1878); ‘History of the Town of Hamden, Conn.’; ‘Life of Captain Jonathan Mix.’

BLAKE, William Rufus, American actor: b. Halifax, N. S., 1805; d. Boston, 22 April 1863. He studied medicine but soon quitted it for the stage, making his first appearance on the American stage at the old Chatham Theatre, New York, under the management of Mr. Barrere, in 1825, as Frederic in ‘The Poor Gentleman,’ and in Elliston's favorite character in ‘The Three Singles.’ His success was great. Jesse Rural, in ‘Old Heads and Young Hearts,’ was one of his best parts. Mr. Blake was a fluent and effective speaker. He was stage manager of the Tremont Theatre, Boston, joint manager of the Walnut Street Theatre, Philadelphia, and stage manager of the Broadway Theatre, New York.

BLAKELEY, Johnston, American naval officer, b. near Seaford, county Down, Ireland, October 1781; lost at sea, 1814. His father emigrated to the United States in 1783, and eventually made his home in Wilmington, N. C. Johnston was graduated at the University of North Carolina in 1800, and on 5 February of that year entered the navy as midshipman, and rose to the rank of captain. On 1 May 1814 he left Portsmouth, N. H., in command of the new sloop-of-war *Wasp*, and very shortly appeared in the English Channel, spreading terror among the merchant ships and seaport towns. On 28 June he fought and defeated the British sloop *Reindeer*, for which exploit Congress voted him a gold medal. On 1 September he destroyed the *Avon* and on the 21st, near the Azores, took the *Atlanta*, which he sent home to Savannah. On 9 October the *Wasp* was spoken by the Swedish bark *Adonis;* and that was the last ever heard of the vessel and of those on board of her. It seems probable that, being heavily armed and sparred, the vessel foundered in a gale.

BLAKELOCK, Ralph Albert, American landscape painter: b. New York, 15 Oct. 1847; d. Elizabethtown, N. Y., 9 Aug. 1919. Graduated, City College in 1869. His art was self-acquired, and like Inness, Wyant and Martin, of whose work he was the best disciple, he inclined strongly to the Barbizon conception of landscape. A feeling for color and tone distinguishes his best work, and he ranked as one of the foremost American landscape painters. His theme was usually the forest primeval with mysterious glades peopled by red men. For many years he suffered the most complete neglect, and the difficulties of caring for a large family on his very slender earnings so affected his mind that it was necessary to confine him in an asylum, where he remained for many years. Friends exhibited his pictures from time to time, and at last, in 1913, the National Academy bestowed a tardy recognition on his talent by making him an associate, the degree of academician following two years later. In 1916 he was released from the asylum. Among his works are ‘Indian Girl, Uinta Tribe’; ‘Shooting the Arrow’ (1880); ‘Bannock Wigwam in Peaceful Vale’ (1883); ‘Autumn’ (Mrs. Kurtz, New York); a beautiful moonlight scene, in the Lambert collection, Paterson, N. J.; ‘Sunset, Nevarra Range’ (W. T. Evans, New York); ‘The Pipe Dance’ (perhaps his best picture), Metropolitan Museum, New York; ‘Colorado Plains,’ Corcoran Gallery, Washington, D. C.; ‘October Sunshine,’ Worcester Museum; the ‘Canoe Builders,’ ‘Sunset’ and ‘Moonrise,’ in the National Gallery of Washington; ‘The Capture,’ in the Brooklyn Institute Museum; ‘Moonlight,’ in the Toledo Museum, etc.

BLAKESLEE, Albert Francis, American botanist: b. Geneseo, N. Y., 9 Nov. 1874. A graduate of Wesleyan University, Connecticut, he was assistant botanist at Harvard 1899–1900, instructor at Radcliffe College 1900–02, teaching fellow at Harvard 1901–03, and became director of the Connecticut Agricultural College Summer School 1907. In 1903 he went to Venezuela as collector for the Harvard Cryptogamic Herbarium and in 1904–06 was investigator for the Carnegie Institute in Europe. He is the author of ‘ Sexual Reproduction in the Mucorineæ’ (1904) and ‘Trees in Winter’ (1913). He is a brother of George Hubbard Blakeslee.

BLAKESLEE, George Hubbard, American educator, traveler and author: b. Geneseo, 27 Aug. 1877. A graduate of Wesleyan University (1893) and Ph.D. Harvard University (1903), he also studied at Johns Hopkins, Berlin, Leipzig and Oxford. He was instructor in history in Clark College in 1903; traveled in Hawaii, the Philippines, China and Russia 1906–08; became professor of history in Clark University, Worcester, Mass., and associated with president G. Stanley Hall founded and edited *The Journal of Race Development*, and organized there the annual conference on international problems. A contributor to *The Outlook* and other periodicals, he is also the author of ‘The Far East’ (1909); ‘The Near East and Africa’ (1910); ‘Japan’ (1911); and editor of the Clark University lectures ‘China and the Far East’ (1910) and ‘Japan and Japanese-American Relations’ (1912).

BLAKESLEY, Joseph Williams, English clergyman: b. London, 6 March 1808; d. Lincoln, 18 April 1885. He graduated at Trinity College, Cambridge, in 1831; was fellow there 1831–45, and select preacher 1840–43; became a member of the New Testament Committee on Bible Revision in 1870; and dean of Lincoln in 1872. His publications include ‘Life of Aristotle’ (1839); ‘Conciones Academicæ’ (1843); and an edition of ‘Herodotus’ (2 vols., 1852–54).

BLAKEY, Robert, English writer: b. Morpeth, Northumberland, 18 May 1795; d. Belfast, 26 Oct. 1878. He bought the Newcastle *Liberator* in 1838, and got himself into trouble with the government on account of certain alleged seditious articles which he published. In 1848 he became professor of logic and metaphysics at Queen's College, Belfast. Among his works are ‘Treatise on the Divine and Human Wills’; ‘History of Moral Science’; ‘Historical Sketch of Logic’; ‘Temporal Benefits of Christianity’; and a series of books on angling.

BLANC, blŏn, **Anthony**, American prelate: b. Sury, France, 11 Oct. 1792; d. New Orleans, 20 June 1860. He was ordained to the Roman Catholic priesthood in 1816; went to Annapolis, Md., in 1817; was appointed bishop of New Orleans in 1835, and became archbishop there in 1850.

BLANC, Jean Joseph Louis, French historian, publicist and socialist: b. Madrid, 29 Oct. 1811; d. 6 Dec. 1882. He studied with great success in the college at Rodez, and completed his education at Paris. He was for a short time an attorney's clerk, afterward a teacher of mathematics and a private tutor. Subsequently at Paris he devoted himself to the career of journalism, fighting stoutly in the ranks of the militant democracy. In 1839 he founded the *Revue du Progrès*, in which first appeared his great work on socialism, ‘De l'Organisation du Travail’ (separately published in 1840). In this work he condemns individual and competitive rivalry in labor; society should not be subjected to a perpetual combat, but should form a harmonious whole, in which each member should contribute according to his abilities and be recompensed according to his needs. In 1841–44 appeared his ‘Histoire de Dix Ans’ (1830–40), in which he vigorously exposed the trickery and jobbery of the government of Louis Philippe, and which greatly contributed to bring about its downfall. On the outbreak of the revolution of 1848 Blanc was elected a member of the provisional government, and appointed president of the commission for the discussion of the question of labor. He has been unjustly charged with creating and organizing the disastrous scheme of national workshops, a scheme which he strenuously opposed. After the closing of these workshops, and the June insurrection of 1848, he was prosecuted for conspiracy, but escaped to England, where he took up a lengthened residence. During this period he wrote the bulk of his famous ‘Histoire de la Révolution Française’ (12 vols., 1847–62). His other works are ‘Lettres sur l'Angleterre’ (1865–67); ‘Histoire de la Révolution de 1848’ (1870); ‘Questions d'Aujourd'hui et de Demain’ (1873–74), etc. On the downfall of the second empire (1870) Blanc returned to Paris and became a member of the National Assembly in 1880. Here he pursued a consistently radical policy without embracing all his former socialistic theories. He is regarded as the founder of state socialism. He believed that individual liberty could only be had under a strong central government, but that industry should be coöperative. Consult Fiaux, ‘Louis Blanc’ (in ‘Portraits politiques contemporains,’ Vol. II, Paris 1883), and Jonannet, A., ‘Les théories sociales de L. Blanc’ (Dijon 1902).

BLANC, Ludwig Gottfried, German philologist: b. Berlin, 19 Sept. 1781; d. Halle, 18 April 1866. He was educated at the French Theological Seminary in Berlin, and ordained as pastor at Halle. In 1811 he was accused of taking part in a conspiracy against the King of Westphalia, was imprisoned at Magdeburg, and later at Kassel, until released in 1813 by a Russian skirmishing corps. He was chaplain in the Prussian army in the war of 1814–15; from 1822 was professor of the Romance languages at the University of Halle; and in 1860 was appointed preacher at the cathedral in that city. An authority on Dante, he wrote a ‘Dante Vocabulary’ (in French); ‘Attempt at a Philological Explanation of Several Disputed Points in the «Divine Comedy»’; and translated the ‘Divine Comedy’ into German. He also wrote ‘Grammar of the Italian Language’; and a ‘Handbook of the Most Remarkable Facts of Nature and the History of the Earth and Its Inhabitants.’

BLANC, Marie Thérèse («Thérèse Bentzon»), French essayist and novelist: b. Seine-Port 1840; d. 1907. She visited the United States where she was a close student of social conditions. For several years she was a member of the editorial staff of the *Revue des Deux Mondes*. Her translations from English included works by Dickens, Bret Harte, Aldrich and Ouida. She wrote the novels ‘La vocation de Louise’ (1873); ‘Sang mêlé’ (1875); ‘Un remords’ (1878); ‘Yette, histoire d'une jeune Créole’ (1882); ‘Yvonne’ (1881); ‘Tony’ (1884); ‘Jacqueline’ (1893); ‘Une double épreuve’ (1896); ‘Au dessus de l'abime’ (1905). Her other works include the essays ‘Littérature et mœurs étrangères’ (1882); ‘Les nouveaux romanciers américains’ (1885); the travel volume ‘Nouvelle France et Nouvelle Angleterre: Notes de Voyage’ (1899); ‘Choses et gens d'Amérique’; ‘Questions Américaines’; ‘Femmes d'Amerique.’

BLANC, Paul Joseph, French genre painter: b. Paris 1846; d. Paris, 5 July 1904. He studied under Bin and Cabanel. He won the Grand Prix de Rome in 1867; the first-class medal of the Paris Salon in 1872; the decoration of the Legion of Honor in 1878; and the first-class medal in the Paris Exposition of 1889. One of his best-known works is a series of decorative compositions depicting the consecration, baptism and triumph of Clovis; ‘The Invasion’ (1873); and ‘Roger and Angelique’ (1876). He also attained reputation by his portraits of French public men.

BLANC, Mont. See Mont Blanc.

BLANCHARD, Amy Ella, American art teacher and author: b. Baltimore 1856. After studying art in New York and Philadelphia she taught drawing and painting in Plainfield, N. J., and became known for her semi-historical tales, among others ‘A Girl of '76’ (1898); ‘A Heroine of 1812’ (1901); ‘A Frontier Knight’ (1904); and the ‘Corner’ and ‘Little Maid’ series.

BLANCHARD, blŏṅ-shär, **Emile**, French naturalist: b. Paris, 6 March 1819; d. 1900. He is especially renowned as an entomologist, and is the author of many scientific works, including ‘Researches into the Organization of Worms’ (1837); ‘Natural History of Orthopterous and Neuropterous Insects’ (1837–40); ‘History of Insects, etc.’ (1843–45); ‘Agricultural Zoology’ (1854); ‘Organization of the Animal Kingdom’ (1854–64), etc.

BLANCHARD, François, French aeronaut: b. 1753; d. 1809. He invented a hydraulic machine in his 19th year, and afterward constructed a flying ship, which, by means of a counterpoise of six pounds, was raised to more than 20 feet from the ground. He eagerly availed himself of the discoveries of the brothers Montgolfier. After having made his first aerostatic voyage, 4 March 1784, he crossed the Channel from Dover to Calais, 1785, with Dr. Jeffries, a gentleman of Boston. In the same year, at London, he first made use of a parachute invented by him, or, according to others, by Etienne Montgolfier. He visited the United States in 1796, his 46th ascent being made in New York. His wife, Marie Madeleine Sophie Armant, continued (after his death) to make aerial voyages; but in June 1819 she was killed in an ascent at Paris.

BLANCHARD, Jacques, French painter: b. Paris 1600; d. 1638. He received the first lessons of his art from Bellori, his maternal uncle, studied some time at Lyons, and in 1624 repaired to Rome. After two years he visited Venice, studied the works of Titian and the other great colorists of his school, and executed several paintings which gave him a name. After his return to Paris he executed a great number of works, which procured him the surname of «the French Titian.» His best piece, a ‘Descent of the Holy Spirit,’ was painted for the cathedral of Nôtre Dame.

BLANCHARD, Newton Crain, American legislator: b. Rapides Parish, La., 29 Jan. 1849. He was educated at Louisiana State University and studied law at Tulane. He became a member of the Louisiana Constitutional Convention in 1879 and congressional representative from 1881 to 1893, when he was appointed to complete the unexpired term of E. D. White as United States senator. He became an associate judge of the Supreme Court of Louisiana in 1897 and governor of the State from 1904 to 1908.

BLANCHARD, Thomas, American inventor: b. Sutton, Worcester County, Mass., 24 June 1788; d. 16 April 1864. He joined his brother in the manufacture of tacks by hand, and at the age of 18 commenced his invention of a tack-machine, which in six years he brought to such perfection that by placing in the hopper the iron to be worked, and applying the motive power, 500 tacks were made per minute with better finished heads and points than had ever been made by hand. He sold the patent for $5,000. About this time various attempts were made in the United States armories to turn musket-barrels with a uniform external finish. Blanchard undertook the construction of a lathe to turn the whole of the barrel from end to end, by the combination of one single self-directing operation. About three inches of the barrel at the breech was partly cylindrical and partly with flat sides; these were all cut by the same machine, ingeniously changing to a vibrating motion as it approached the breech. He then invented an ingenious machine for turning gunstocks, which, with improvements and modifications, came to do the work of 13 machines, and is applied to a great variety of objects, such as busts, shoe lasts, handles, spokes, etc. Blanchard was also interested at an early day in the construction of railroads and locomotives and in boats contrived to ascend rapid rivers. He also invented a machine for cutting and folding envelopes, a steam wagon before the use of locomotives, and a process for bending heavy timbers.

BLANCHE, August Theodor, Swedish dramatist and novelist: b. Stockholm, 17 Sept. 1811; d. Stockholm, 30 Nov. 1868. His comedies and farces,— more particularly 'Jenny, or the Steamboat Trip'; 'The Doctor'; 'The Rich Uncle,' and 'The Foundling'—made all Sweden laugh; while his realistic fictions,— among them 'The Spectre'; 'Tales of a Cabman,' and 'Sons of North and South,'— are eagerly read. His complete works were issued at Stockholm in 15 volumes (1889–92).

BLANCHE, Gustave, Canadian clergyman: b. Josselin, France, 30 April 1848. He was called to the bar, fought in the Franco-Prussian War, joined the Eudist order in 1873, and was consecrated vicar-apostolic of the Gulf of Saint Lawrence and titular bishop of Sicca, 28 Oct. 1905.

BLANCHE OF BOURBON, Castilian Queen: b. 1338; d. 1361. She was the daughter of Peter, Duke of Bourbon, and in 1353 married Peter, King of Castile, surnamed the Cruel. Don Frederick, Peter's natural brother, had been deputed to meet her at Narbonne and bring her into Spain, and she is said to have so far forgotten herself as to conceive a violent passion for him. Rumors to this effect had reached the King's ears, and though he celebrated the marriage he soon showed that he had placed his affections elsewhere. He shortly after declared the marriage null, imprisoned the Queen in the castle of Medina-Sidonia, and is said to have gotten rid of her by poison. Her fate became a favorite theme with poets and ballad makers.

BLANCHE OF CASTILE, French Queen: b. 1187; d. Milan, November 1252. She was the daughter of Alphonso IX, married Louis VIII of France and became the mother of Louis IX («Saint Louis»). On the death of her husband she anticipated the formal appointment of a regency by procuring the immediate coronation of her son, and during his minority held the reins of government in his name with distinguished ability and success, breaking up a league of the barons and repelling English assaults. In 1244, when Saint Louis joined the Crusade (which she strenuously opposed) and took his departure for the Holy Land, she again became regent and gave new proofs of her statesmanlike qualities. Consult Berger, 'Histoire de Blanche de Castile.'

BLANCHESTER, Ohio, town in Clinton County, on the Baltimore and Ohio and the C. M. and L. railroads, 30 miles northeast of Cincinnati. Its industrial establishments comprise pumpworks, rice manufactories, a creamery and canning factory. The value of all taxable property is estimated at $2,000,000. The town has a public school. Pop. 1,800.

BLANCHING, the process which prevents or checks the formation of chlorophyll and other substances in plants by excluding light. Gardeners make frequent use of the process. It alters the flavor as well as lightens the color of celery, sea-kale, asparagus, etc., and is generally accomplished by covering the plants with earth, boards, straw, paper, etc., or, in a small way, by inverted flower-pots, kegs, or barrels perforated at the top.

BLANCO, blän'kō, **Antonio Guzman,** Venezuelan soldier: b. Caracas, 29 Feb. 1828; d. 28 July 1899. He became prominent in the Federalist revolts, 1859–63, and when his party triumphed, was made First Vice-President in 1863 under Falcon, who was deposed in the revolution of 1868. Blanco led a successful counter-revolution in 1870, and was President, 1870–77, 1879–84, 1886–87. In 1893 he was appointed Minister to France, where he resided virtual ruler and dictator of his country till his death. Under his absolutism education was improved, economic resources were developed and the finances strengthened.

BLANCO, José Félix, Venezuelan historian: b. Mariana de Caracas, 24 Sept. 1782; d. Caracas, 8 Jan. 1872. At different times he acted in the capacity of priest, soldier and statesman, and held the Ministry of War (1837) and Finance (1854). He was one of the leaders in the revolution at Caracas, 19 April 1810, and was the first editor of the great historical work in 14 volumes, 'Documentos para la historia de la vida pública del Libertador,' etc.

BLANCO, Pedro, Bolivian statesman: b. Cochabamba, 19 Oct. 1795; d. Sucre, January 1829. He served with the Spanish army in 1812, but soon joined the patriots, and served with them till the end of the revolution. In 1828 he became a general, and in the same year, when Sucre fell, was made President of Bolivia, but was superseded in the revolution of 31 Dec. 1828. He was shot in Sucre.

BLANCO, Ramon y Arenas, Marquis de Peña Plata, Spanish soldier: b. San Sebastian, Spain, 1833; d. Madrid, 4 April 1906. He began his military career in 1855 as lieutenant, was promoted captain in 1858, and won the rank of lieutenant-colonel in the war with San Domingo. From 1894 to 1896 Blanco served in the Philippines as governor of Mindanao. He was captain-general in Cuba in 1897–98, where his measures were those of repressive cruelty.

BLANCO, Cape (literally, «white cape»), a name given to a number of capes by the Spaniards, Portuguese and Italians, e.g., to headlands in Majorca, Anatolia, Tunis, Morocco, Syria, Peru and Costa Rica. It corresponds to the French *cap blanc*. The cape best known by this name is a headland on the west coast of Africa, in lat. 20° 47′ N., and long. 16° 58′ W., the extremity of a rocky ridge which projects from the Sahara in a westerly direction, and then bending southward forms a commodious harbor called the Great Bay. Cape Blanco was first discovered by the Portuguese in 1441. The lofty headland on the westernmost point of Oregon, in Curry County, is called Cape Blanco or Orford.

BLANCO ENCALADA, Manuel, Spanish-American soldier: b. Buenos Aires, 5 Sept. 1790; d. 5 Sept. 1876. He distinguished himself in the Chilean war of independence. He was chosen President of Chile in July 1826, but soon resigned and was made general of the army. He unsuccessfully invaded Peru in 1837, and was not allowed to retire till he had signed a treaty of peace. Chile annulled this treaty, and he was court-martialed but acquitted. In 1847 he was intendant of Valparaiso, and in 1853–58 Minister to France.

BLAND, Edith Nesbit (E. NESBIT), English writer: b. London, 15 Aug. 1858. She was married to Hubert Bland, 1879. She has written several volumes of verse, as well as a series of charming and popular children's books and novels. Her published works include 'Lays and Legends' (1886–92); 'Leaves of Life' (1888); 'A Pomander of Verse' (1895); 'Grim Tales' (1893); 'The Marden Mystery' (1896); 'Songs of Love and Empire' (1897); 'The Story of the Treasure Seekers' (1899); 'Pussy and Doggy Tales' (1899); 'The Book of Dragons' (1900); 'Nine Unlikely Tales'; 'Thirteen Ways Home' (1901); 'Five Children and It' (1902); 'The Red House' (1903); 'Man and Maid' (1906); 'The House of Arden' (1908); 'Salome and the Head' (1909); 'Ballads and Lyrics' (1910); 'The Wonderful Garden' (1911); 'Wings and the Child' (1913); 'Garden Poems.'

BLAND, John Otway Percy, English author and journalist: b. Whiteably County, 15 Nov. 1863. He was educated in Switzerland and at Trinity College, Dublin. In 1883 he joined the Chinese Imperial Maritime Customs. For two years he was private secretary to Sir Robert Hart but resigned in 1896 to become secretary to the municipality for the foreign settlement at Shanghai. In 1906 he assumed the post of representative in China of the British and Chinese Corporation. He left China in 1910, with the civil rank of the Order of the Double Dragon. He was also *Times* correspondent at Shanghai 1897–1907; Peking 1907–10. Since returning to England he has been engaged in journalism and lecturing, in which capacity he came to Boston in 1912. His publications include 'Lays of Far Cathay' (1900); 'Houseboat Days in China' (1909); 'China under the Empress Dowager' (1910); 'Annals and Memoirs of the Court of Peking' (1913); 'Recent Events and Present Policies in China' (1912); 'Li Hung Chang' (1917).

BLAND, Richard Parks, American legislator: b. near Hartford, Ky., 19 Aug. 1835; d. Lebanon, Mo., 15 June 1899. He received an academical education, and, between 1855 and 1865, practised law in Missouri, California and Utah, and was engaged for some time in mining. In 1865 he settled in Rolla, Mo., and practised there till he removed to Lebanon in the same State. He was a member of Congress in 1873–95 and from 1897 till his death. In 1896 he was a conspicuous candidate for the Presidential nomination in the Democratic National Convention, but on the fourth ballot his name was withdrawn and the vote of his State was cast for William J. Bryan. In the 43d Congress he opposed the bill for the demonetization of silver, afterward called by him «the crime of '73.» Mr. Bland was best known as the leader in the lower House of Congress of the Free-Silver movement and the author of the Bland Silver Bill of 1878, which, as amended by the Senate, was passed over the veto of President Hayes. It provided for the coinage of not less than $2,000,000 nor more than $4,000,000 worth of silver bullion monthly. The bill was repealed by the Sherman Law of 1890. At the time of his death he was a member of the committees on coinage, weights and measures and expenditures on public buildings. He published 'Proposed Annexation of Hawaii' (1898). Consult Bywars, W. V., 'An American Commoner: The Life and Times of R. Parks Bland' (Columbia, Mo., 1900).

BLAND, Theodoric, American military officer: b. Prince George County, Va., 1742; d. 1 June 1790; he studied medicine in the University of Edinburgh, and for a time practised in England. He returned home in 1764, wrote against Governor Dunmore under the name of Cassius, and was active in his profession until the outbreak of the Revolutionary War, when he sided with the Colonists and became captain of the first troop of Virginia cavalry. In 1777 he joined the main army as a lieutenant-colonel and later became a colonel. He distinguished himself at the battle of Brandywine and was placed in command of the prisoners taken at Saratoga, who were marched to Charlotteville, Va. In 1780–83 he was a member of the Continental Congress and was a representative from Virginia to the first Federal Congress in 1789. He was an intimate friend of George Washington. 'The Bland Papers,' containing valuable historical material on the Revolutionary period, were collected and edited by Charles Campbell (Parkersburg 1840).

BLANDINA, Saint, virgin martyr in the reign of Marcus Aurelius, A.D. 177. She was a slave and had been imprisoned with her master — also a Christian — for confessing to the faith. She was subjected to horrible tortures but remained steadfast throughout. Some of the Christians were released on abjuration, but Blandina rejected the offer to purchase her life at the sacrifice of her faith. A series of fresh tortures then awaited her. With other coreligionists she was bound to a stake in the amphitheatre at Lyons during some public games, but the wild beasts let loose in the arena failed to harm her. For some days she was compelled to witness the sufferings of her companions, and was then half-burnt, gored by a wild bull, and finally killed with a dagger. Eusebius tells the story in a report from the church of Lyons to the churches of Asia Minor. Her feast day is 2 June.

BLANDRATA, or BIANDRATA, Giorgio, Italian physician and Unitarian propagandist: b. Saluzzo, Piedmont, about 1515; d. about 1590. He practised for a time in Pavia, where he fell under suspicion of heresy; the freedom with which he expressed his religious views made it necessary for him to flee to Geneva in 1556, where he aroused the dogmatic wrath of Calvin, with whom he engaged in a violent controversy. Blandrata appears to have been worsted in theological hair-splitting, for his anti-trinitarianism made him so many enemies in Geneva that he migrated to Poland, where he spread the Unitarian doctrines. In 1563 he moved to Transylvania, where he converted the ruler, Prince John Sigismund, and became his physician. Here he took part in public disputations with learned opponents and attracted a large following. He eventually returned to the fold of the Roman Catholic Church. It is said that he was strangled while asleep by his nephew. He wrote 'Professioni di fede antitrinitaria,' an edition of which appeared in 1794. Consult Malacarne, 'Commentario delle opere di Giorgio Biandrata' (Padua 1814).

BLANK VERSE, verse without rhyme. This was the invariable form of the poetry of the ancients, but it is now peculiar to the Italian, English and German languages. The poetry of the Anglo-Saxons and the earliest English poetry was not rhymed, yet it is not generally called blank verse, as their versification had a peculiarity of its own called alliteration. When rhyme, however, was once introduced into English verse, it was for a long time regarded as the exclusive form of versification, and the Earl of Surrey, who was beheaded by order of Henry VIII, in 1547, is said to have been the first to use blank verse in England, namely, in his translation of the second and fourth books of Virgil's 'Æneid.' The most common form of blank verse in English poetry is the decasyllabic, such as that of Milton's 'Paradise Lost' and the dramas of Shakespeare. From the 16th century onward the unrhymed decasyllabic (also called the iambic pentametre or unrhymed heroic) has been the regular measure of English dramatic and epic poetry. Dryden, indeed, after the Restoration, introduced rhyme into his tragedies, in imitation of the French rhymed plays; but after keeping the stage for a number of years, they became intolerable to the English ear, and the introduction of rhyme into the drama has never since been attempted in England. Shakespeare not uncommonly ends a scene with a few lines of rhyme, although the rest of the scene is in blank verse, and in the subordinate play interwoven with the action of Hamlet blank verse is used throughout. The first use of the term blank verse is said to be in Hamlet ii, 2: «The lady shall say her mind freely, or the blank verse shall halt for't.»

BLANKENBURG, Rudolph, American public official: b. Lippe-Detmold, Germany, 16 Feb. 1843. He was educated in his native city, and in 1865, in his 22d year, came to the United States, where, first as a traveling salesman and later as manufacturer, he acquired great wealth, retiring from business in 1909. From 1877 he interested himself in civic improvement and reform politics in Philadelphia; in 1905 was elected county commissioner, and in 1911 and again in 1913 mayor of the city. As an able administrator he contributed largely to improved local conditions. In earlier years he was a world-wide traveler. He also became known by his numerous magazine and newspaper articles on social, economic and religious questions.

BLANKET (that is «fine white» goods), a heavy bed or horse cover, of a fabric with a thick soft nap on both sides. Originally made entirely of wool, and still so in the finest grades, most of the medium and cheap blankets are now made with a cotton chain or warp and a wool filling, as cheaper, stiffer and almost as durable in good condition. In the finest grades of American blankets, the filling is Australian wool, the longest and softest fibre known; the warp of American wool. The cheapest ones have for filling the shorter combings of wool, shoddy, etc.; ordinary horse blankets the same or still coarser half-cleaned wool, and largely animal hair. Of late also an immense quantity of all-cotton blankets are made, the nap being cotton wool; these have competed less with wool blankets than with comfortables, whose sale for a time they cut in half. They are used for economy, where heavy blankets are not needed, and to replace cotton sheeting in cold rooms for children, etc. The most famous blankets in the world are those of the Mysore in India, so delicate that one 18 feet long can be rolled inside a hollow bamboo. In the United States they are a specialty in southwestern Indian domestic manufacture, especially among the quite civilized Navajos (q.v.), whose rough hand looms and stick shuttles turn out blankets weighing 20 pounds or more, and selling for $1 and $2 a pound, much prized by Alaskan and Klondike gold-seekers, also by tourists, as well as for decoration on account of the rich coloring. But of civilized manufacture, the finest are from California, Nevada and Oregon and from Minneapolis; some of these retail for $25 per pair with a weight of less than 10 pounds. Maine, Ohio and West Virginia also produce very fine goods. Below the above fancy price, of which much is loading for short runs, prices range for all-wool blankets from $20, the highest usually kept in stock, down to $7.50, and for cotton-warp down to $2, all-cotton, $1. Few blankets have been imported into this country since 1860. The early manufacture here was «a series of costly and futile experiments,» except a few coarse ones for army or navy use and for slaves on plantations, for which in 1831 a mill was started in Pendleton, S. C.; another to make «Indian» blankets was opened in Buffalo the same year. But the first effective attempt was under the sharp tariff of 1842, soon swept away by the moderate one of 1847. The tariff bill of 1857, however, which formed one of the Southern counts for secession, taxed imported blankets so heavily that by 1861 importations had practically ceased. In 1860 the United States' total manufacture was 616,400 pairs, mainly in New England, Pennsylvania and California. In 1880 this had increased to 4,400,000, gross value $6,840,000, and the prices had dropped so much that the cheaper grades had gone out of use; the foreign commissioners at the Centennial of 1876 reported that for weight, thickness, softness and perfection of surface nothing in Europe compared with the American, and that the European cheaper grades could not be sold even to the Indians. But competition had so glutted the market that in 1878 a great auction was held in New York to clear them off, at heavy sacrifice. In 1890 the manner of report was changed to square yards — 20,793,644 of «house blankets» valued at $7,153,900 and 5,507,074 of horse blankets, $1,721,516. For some reason, probably the larger use of comfortables, the use of the all or part-wool article fell off heavily in the last decade — to 18,155,505 square yards, valued at $5,200,959 — though horse blankets increased to 7,315,304, valued at $1,740,988, or about the same as before. The chief seats of manufacture were Pennsylvania for all-wool, and Massachusetts for cotton-warp, though Indiana, Minnesota, California and several other States furnished large quantities.

The nap is formed in the finest grades, and till recently was so altogether, by pulling up the fibre with teazles; these have now been replaced in the cheaper makes with steel teeth or brushes on revolving cylinders, which, however, are too inflexible and liable to tear the goods to be trusted with expensive ones. The use of Jacquard patterns with two or three colors, in place of printed ones, is another change which has popularized blankets by increasing their beauty. Consult Hollister, ‘The Navajo and His Blanket’ (Denver 1903).

BLANKET BALLOT. See BALLOT.

BLANKET VEIN, a term in use among miners to indicate any nearly horizontal deposit of mineral matter. It includes the term «bedded vein,» which refers to any deposit parallel to the bedding of the enclosing rocks. Many of the bedded veins are not true veins (fissure fillings) at all, but constitute layers laid down at the same time as the enclosing rocks. Such are the iron formations of the Lake Superior region. See VEIN.

BLANQUI, blän-kẹ, **Jérôme Adolphe,** French economist: b. Nice 1798; d. in Paris, 28 Jan. 1854. While studying medicine at Paris he made acquaintance with Jean Baptiste Say and was induced to devote himself to the study of economics. He succeeded Say in the Conservatoire des Arts et Métiers as professor of industrial economy. Blanqui, who favored a free-trade policy, published, among other works, ‘Précis Elémentaire d'Économie Politique’ (1826) and ‘Histoire de l'Économie Politique en Europe’ (4th ed., Paris 1860).

BLANQUI, Louis Auguste, French revolutionist: b. at Puget-Théniers, department of Alpes-Maritimes, 7 Feb. 1805; d. 1 Jan. 1881. He made himself conspicuous chiefly by his passionate advocacy of the most extreme political opinions, for which he suffered with the pride of a martyr. He was one of the foremost fighters in the French revolutions of the 19th century. In 1830 he was decorated for his valor at the barricades. In 1848 he figured as the chief organizer of the popular movement under the provisional government. He took the lead also in the revolutionary *attentat* of 15 May 1848, the aim of which was to overthrow the Constituent Assembly. At the head of an excited mob he demanded of the French representatives the resuscitation of the Polish nationality, while one of his friends pronounced the dissolution of the Assembly. For his share in these disturbances he was sentenced to 10 years' imprisonment in Belleisle. In 1861 he was again imprisoned. After the downfall of the second empire in 1870, Blanqui resumed his revolutionary activity, and, in 1871, took a prominent part in forming the Commune. Being too unwell to endure transportation to New Caledonia (the sentence imposed by the court for his final effort to regenerate society through terror), he was condemned to imprisonment for life, from which he was released in 1879. He spent nearly half of his life in prison. His ‘Critique Sociale,’ published four years after his death, formulates the economic doctrine of French radical socialists or *Blanquistes*.

BLANQUILLO, blạn-kēl'yō, a fish of the Gulf of Mexico (*Caulolatilus chrysops*), related to the tilefish. The name is also given in southern California to the yellowtail (q.v.).

BLARNEY, Ireland, a village seven miles northwest of the city of Cork, near the stream of same name, here crossed by a handsome bridge of three arches. It is a small but well-built place. Flax and cotton were formerly manufactured to some extent, but both of these branches have now decayed. Spinning and dyeing woolen yarn is, however, still carried on, and there is an extensive tweed manufactory. Blarney Castle stands on an isolated limestone rock at the junction of the Blarney and Comane. Erected in the 15th century, it was the scene of several interesting historical events but derives its chief notoriety from a stone in its northeast angle, several feet from the top, bearing a Latin inscription recording the date of the erection and called the «Blarney Stone.» To this stone tradition ascribes the faculty of communicating to all who kiss it that species of most persuasive fluency of speech commonly called «blarney.» The «groves of Blarney» are extensive and interesting, and beneath the castle there are also some curious natural caves. In the summer season Blarney is visited by great throngs of tourists, many of whom risk the perilous ascent to the top of the castle in order to kiss the far-famed Blarney Stone.

BLASERNA, Pietro, Italian physicist and public official: b. 1836; d. 26 Feb. 1918. He was professor of experimental physics in the University of Rome and president of the Senate of the Kingdom of Italy. He wrote monographs on the dynamic theory of heat, the conservation of force, the sound theory in relation to music, and other subjects.

BLASHFIELD, Albert Dodd, American illustrator: b. New York, 31 July 1860; brother of Edward Howland Blashfield (q.v.). He was educated at the Brooklyn Collegiate and Polytechnic Institute and at Alexander Military Institute. He studied art at the Art Students' League, New York, and specializes in the illustration of periodicals.

BLASHFIELD, Edwin Howland, American artist: b. New York, 15 Dec. 1848. He was educated at the Boston Latin School, studied in Paris under Léon Bonnat, was also advised by Gérôme and Chapu, and began exhibiting in the Paris Salon in 1874. He returned to the United States in 1881, and has since distinguished himself by the execution of large decorative works. Among his noteworthy productions in this line are one of the domes of the Manufacturers' building in the World's Columbian Exposition, the great central dome of the Library of Congress and the new apartment of the appellate court in New York; besides ceiling and panel work in the residences of C. P. Huntington, W. K. Vanderbilt and George W. C. Drexel and in the Astoria ballroom and several clubhouses in New York. Other works are the ceiling and three lunettes in the Prudential Insurance Company's building, Newark, N. J.; court-room decorations in Baltimore court-house; large panel in the Iowa State Capitol; decoration of the entire chancel, Church of the Saviour, Philadelphia; decoration in Great Hall, College of the City of New York; also in the Wisconsin State Capitol, the court-house and Federal building, Cleveland, and decorations in the South Dakota capitol and in the court-house of Youngstown, Ohio. For the two latter he received the gold medal of honor of the Architectural League of New

York in 1911. He has lectured on art at Columbia, Harvard and Yale universities and in June 1912 was appointed member of the National Commission of Fine Arts by President Taft. He is joint author with Mrs. Blashfield of ‘Italian Cities’ (1900, new ed., 1913); and, with Mrs. Blashfield and A. A. Hopkins, co-editor of Vasari's ‘Lives of the Painters’ (4 vols., 1897), and sole author of ‘Mural Painting in America and the Modern Tendency’ (1913).

BLASIUS, Saint, or **SAINT BLAISE,** bishop of Sebaste, in Armenia, is said to have suffered martyrdom about 316, at the time of the persecution under Licinius, when he was taken prisoner at the command of the governor, Agricolaus. His feast day is celebrated in the Greek Church on 11 February and he is commemorated in the oldest martyrologies of the Roman Church. In the Roman Martyrology, 3 February is assigned to him. He is the patron saint of wool-combers, his flesh having been torn by iron combs. He is especially invoked in diseases of children and animals, and ailments connected with the throat are more particularly in his province.

BLASPHEMY, is somewhat variously defined. According to the most general definition, it means the speaking irreverently of the mysteries of religion; and formerly, in Roman Catholic countries, it also included the speaking contemptuously or disrespectfully of the Holy Virgin or the saints. Public blasphemy has been considered by the Catholic Church as an unpardonable sin, and it was formerly punished with death by the municipal laws. The 77th novel of Justinian assigned this punishment to it; and the capitularies inflicted the same punishment upon such as, knowing of an act of blasphemy, did not denounce the offender. The former laws of France punished this crime with fine, corporal punishment, the gallows and death, according to the degree and aggravation of the offense. The records of the parliaments supply numerous instances of condemnation for this crime and many of punishment by death; others of branding and mutilation. A man was for this offense condemned to be hanged, and afterward to have his tongue cut out and the sentence was executed at Orleans as late as 1748. But it is remarked by a writer in the French ‘Encyclopédie Moderne,’ that we should form an erroneous opinion, from the present state of society, of the effect of this offense and the disorders it might introduce in former times; for religion was once so intimately blended with the government and laws, that to treat the received articles of faith or religious ceremonies with disrespect was in effect to attack civil institutions.

By the common law of England, as stated by Blackstone, blasphemy consists in denying the being and providence of God, contumelious reproaches of Jesus Christ, profane scoffing at Holy Scripture, etc., and is punishable by fine and imprisonment, or corporal punishment; the offense is also statutory, the Statute 9 and 10 William III cap. xxxii, declaring that if any one shall deny any of the persons of the Trinity to be God, or assert that there are more gods than one, or deny the truth of Christianity or of the Scriptures, he shall be incapable of holding any office; and for a second offense be disabled from suing any action, or being an executor, and suffer three years' imprisonment.

By the law of Scotland, as it stood under acts of 1661 and 1695, the punishment of blasphemy was death. Blasphemy consisted of railing at or cursing God, or of obstinately persisting in denying the existence of the Supreme Being, or any of the persons of the Trinity.

The early legislation of the American colonies followed that of the mother country, and in some of them the crime of blasphemy was punished with death; but the penalty was mitigated before the establishment of independence and imprisonment, whipping, setting on the pillory, having the tongue bored with a red-hot iron, etc., were substituted. Several penalties against blasphemy are to be found in the laws of some of the New England States, according to which it is provided that, if any person shall blaspheme, by denying, cursing or contumeliously reproaching God, his creation, government or final judging of the world, or by cursing or reproaching Jesus Christ or the Holy Ghost, or contumeliously reproaching the Word of God, consisting of the commonly received books of the Old and New Testament, he is liable to imprisonment for a term not exceeding five years. But in many States, the offense of blasphemy, not being a subject of special statutory provision, is only punishable either as an offense at common law, or a violation of the statute laws against profane swearing.

Such penal statutes against blasphemy as are not subversive of the freedom of speech or liberty of the press have, in the United States, been declared constitutional. Consult ‘American and English Encyclopedia of Law,’ Vol. IV, p. 582.

BLÄSSER, blĕ'zė, **Gustav,** German sculptor: b. Düsseldorf, 9 May 1813; d. Cannstatt, 20 April 1874. He was associated 11 years with Rauch and for that time shared in all his work. In 1845 he went to Rome, but returned to Berlin when appointed to design one of the groups for the «Schlossbrücke.» His group, ‘Minerva Leading a Young Warrior to Battle,’ is thought to be the best of the series. Among his other works are a statue of Saint Matthew in the church at Helsingfors; the ‘Prophet Daniel’; Barussia in the new museum at Berlin; the statues of Jeremiah, Daniel and Charlemagne for the church at Potsdam; the equestrian statue of Frederick William III at Cologne; ‘Hospitality’; and many busts, including one of Lincoln and one of Washington.

BLAST FURNACE, a mechanical structure built of refractory material in which metallic ores are smelted in contact with fuel and flux, the combustion of the fuel being accelerated by air under pressure. The materials are fed in at the top of the furnace, and after the ores are reduced, the metal, or in some cases the matte, and the resulting slag are tapped in a molten state at or near the bottom; as a rule, the slags, being of less specific gravity than the metal, float upon it. The sizes of blast furnaces vary from a few feet to over 100 feet in height, a horizontal section through the structure showing either circular or rectangular interiors, the circular form being adopted for the larger sizes, while those of smaller height are often made rectangular to permit of introducing a number of tuyeres with air nozzles into a narrow hearth.

A vertical section of a modern American blast furnace shows at the lower part, the hearth or crucible of the shape desired, into which the air is admitted under pressure through tuyeres. On this hearth is superposed an inverted frustum of a cone forming the boshes, and above these the shaft of the furnace ascends in the form of a right cone. The shafts are enclosed by shells of sheet steel or by crinolines formed of bands and beams, and carried on columns. The boshes are usually secured by bands and the crucibles by sheet and metal jackets, the jackets being made strong enough to resist the expansion of the brick work. Modern hearth practice tends toward cast steel or iron hearth jackets with pipe-cooling coils cast integral with the sections of the jacket. When jackets are extended about four feet below the hearth line and banded together strongly, and thoroughly water-cooled, the danger of «break-outs» is very slight. The materials are charged into the shaft so that layers of fuel alternate with layers of ore and flux, the taper of the shaft being sufficient to permit of expansion as the materials are heated, and facilitate their delivery to the hopper formed by the boshes, where the fusing or reduction of ores takes place. The reduced ore, meeting the burning fuel near the tuyeres, is melted, and the liquid slag and metal drop into the hearth or crucible (the cinder or slag floating on the liquid metal), from which they are tapped out from time to time. By heating and drying the blast before it enters the tuyeres combustion is accelerated, and the furnaces produce increased quantities of metal with reduced fuel consumption per unit of product.

The large blast furnaces smelt ores of iron or manganese, or of iron and manganese, and are from 40 to over 100 feet in height, a cross section at the top of the boshes showing a circle from 10 feet to 23 feet in diameter. The blast is heated to 1,200°, and sometimes to 1,500°, or 2,000° F., and is forced into the crucibles or hearth through a set of tuyeres, at pressures from 8 to 18 and, at times, exceeding 20 pounds per square inch. The blast furnaces smelting silver or copper ores seldom exceed 30 feet in height, the horizontal section being rectangular, and the blast pressure but a fraction of a pound. A large modern blast furnace will produce from 400 to 800 tons of pig iron daily, requiring from 1,200 to 2,500 tons of ore, fuel and flux. The cost for construction and equipment of one of these modern furnaces, with its necessary railroad tracks, storage room and bins for receiving the raw material, the mechanism for elevating it to the top of the stack with sufficient blowing engines, boilers, hot blast stoves, etc., ranges from $500,000 to over $1,000,000.

As a rule, blast furnaces smelting other ores than those of iron have the top of the furnace stack open, while, in those producing iron, the top is usually sealed by a bell closing against a hopper, to distribute the stock in the wide throat of the furnace and to control the gases which are the result of the smelting operation, so as to employ the calorific value of these gases for heating the blast or for generating steam in boilers to operate machinery. The use of these gases for firing boilers and also for expansion in gas engines for power purposes is increasing. The blast is heated in hot blast stoves, generally cylinders from 14 to 25 feet in diameter and from 50 to 115 feet high, filled with checker work of fire brick. These stoves are placed in series, large furnaces having as many as four stoves. The gas being admitted to and burned in a stove raises the temperature of the masonry, after which the gas is shut off and the blast forced through the highly heated checkers. By alternating a series of stoves on gas or blast, at intervals of one or two hours, a nearly uniform temperature is maintained.

The blast, after passing through the hot blast stoves, is conveyed in iron or steel conduits, lined with fire brick, to tuyeres, set in the walls of the crucible. These tuyeres are formed of an inner and outer shell with closed ends, water circulating between the two shells. The tuyeres are mostly made of bronze or copper and are set in larger tuyere blocks (also water cooled) of iron or bronze. Nozzles connect the lined air conduits to the tuyeres. The cooling water required by a modern blast furnace amounts to millions of gallons daily. A large furnace requires a boiler equipment of from 3,500 to 5,000 horse power for its blowing, pumping and elevating machinery, electric plant, etc.

Blast furnaces are numerous in all manufacturing countries, but the United States leads in number and size. The Minnesota Steel Company has constructed two at Duluth, each of 280,000 tons annual capacity. In the Pittsburgh steel district are many large furnaces of over 500 tons daily capacity.

It is impossible to give the total number of blast furnaces in the United States, for the reason that the number of those used for producing copper, silver, etc., are not collated, but lists of the furnaces employed in reducing iron ores are carefully reported by the American Iron and Steel Association. There were in 1909, in the United States, approximately 450 blast furnaces, whose aggregate reported capacity amounted to over 25,000,000 long tons of pig iron, but as all of these furnaces are not active at one time (25 per cent being often idle, and sometimes 40 per cent), the total annual output is the only practical gauge of the industry. In 1914, which was a year of depression, 284 furnaces, belonging to 160 concerns, reported a pig iron production of 23,269,731 tons valued at $312,639,706; the other products of these establishments brought their total product up to a valuation of $317,559,053. The year 1915 saw a recovery of pig iron production, which rose to 29,916,213 tons, or a gain of 16.6 per cent over 1909. About a third of the country's blast furnaces are in Pennsylvania, about one-fifth in Ohio, other States having an important share in the industry being Alabama, Michigan, Illinois, New York, Virginia, Tennessee and Wisconsin. Of the pig iron produced 34 per cent is bessemer or low phosphorus, 40 per cent basic and 19 per cent foundry.

There are a little more than 200 plants in the United States manufacturing pig iron. In 1916 it is estimated that they gave employment to about 45,000 men, paying out wages of about $33,000,000, and adding almost $100,000,000 to the value of the ore and materials handled. See

Steel; Iron and Steel; Foundry Practice; Blast Furnace Practice, Modern.

BLAST FURNACE GAS ENGINE. See Internal Combustion Engine.

BLAST FURNACE PRACTICE, Modern. The first requisite for the conduct of blast furnace practice is equipment.

The construction of the Duquesne blast furnaces in 1902 and 1903 marked a great advance in the evolution of the modern blast furnace, for the labor of filling the furnaces, formerly done by hand, was performed mechanically and their size far exceeded any previously built. The capacity of 600 tons per day was fully 50 per cent greater than any other furnace production at that time. These furnaces were 100 feet high and were equipped with powerful blowing engines of large capacity.

The ore was handled in and out of stock pile mechanically by means of a large gantry crane equipped with a scraper bucket spanning the ore yard. The stock house was equipped with steel bins for ore, stone and coke, and the furnaces were filled by an inclined hoist, operating a cylindrical bucket, which was deposited in the stock house on a low car and transferred to the bin chutes for filling.

This bucket was closed by a bell, to the rod of which the hoist rope was hooked, when the tub was hoisted, and this bell when lowered on top discharged the contents automatically into the receiving hopper, thus forming a complete ring in layers of material in this hopper each time a tub was hoisted.

The success of these stacks was followed rapidly by the construction in different parts of the country of stacks of similar dimensions but differing somewhat in equipment, particularly in the charging mechanism. These furnaces for a while gave good results but later were a grave disappointment, owing to the almost universal failure of their linings after a few months' operation, while the Duquesne furnaces made over 1,000,000 tons on their first lining, a result due to the good distribution obtained by the mechanical charging apparatus installed at the Duquesne Works. As a result, charging mechanisms have been generally improved, and still larger furnaces are being erected.

The hoist and distributing mechanism installed at Duquesne seemed to engineers, when built, more complicated and expensive than was necessary, and at the same time they aimed to make a still greater reduction in the labor employed, but some failed to appreciate the importance of good stock distribution on top of the furnace and how it was accomplished by the Duquesne design.

The usual construction now adopted for charging the furnace is mechanical stock handling, storage bins and skip hoists equipped with single or double skips. These dumping skips are responsible for the short life of the furnace linings, for in discharging their load on top of the furnace they cause a sorting of the stock, the finer parts dropping down near the dumping point of the skip and the lumps going farthest away. It is quite possible to obtain a uniform layer in the furnace of coke, limestone and ore, but the fact that more of the lumps went to the side of the furnace farthest from the skip made the gases channel on that side and thus cut the inwall by concentrating the smelting action to that side of the furnace. Good stock distribution may be obtained by mechanically filled furnaces provided with any kind of skip hoists by the use of the rotary distributor, of which there are three distinct types.

From the bins, a larry should weigh and deliver the stock to the skip at the foot of the inclined furnace hoist.

When the plant is located on navigable water and receives its ore that way, the unloading machines operating grab buckets are arranged to deliver the material into the stock piles, from whence it is recovered by another grab bucket, operated by a gantry crane spanning the ore yard and delivering its load into an electrically driven transfer car serving the stock bins. When two or more large furnaces are located away from navigable water, and hence receiving all the stock by rail, a mechanical car dumper is an economy.

Considering next the power equipment, the water tube boiler gives the best results with waste gas as a fuel, but, for more than two furnaces, much greater economy is obtained by burning the gas direct in the cylinder of the gas engine and thus furnishing the electric power required to drive auxiliary machinery about the plant, and in the gas-driven blowing engine the blast required for the furnace. In plants where the water-tube boiler is still in use, the steam engines are compounded and the exhaust steam condensed in a central condenser of large capacity.

Furnace gas is made much more efficient under boilers if cleaned before use, and, if going to internal-combustion engines, a thorough cleaning is absolutely necessary.

For use under boilers, the cleaning may be effected by the wet dust catcher of the contact type where the gas is repeatedly directed against a surface of water kept clean by circulation.

Such dust catchers remove 95 per cent of the solid matter in the gas, absorbing less than 1 per cent of moisture and reducing the temperature about 5 per cent.

Dry Blast.— No furnace plant to-day is complete without some means of regulating the amount of moisture admitted into the furnace in the blast, and the most satisfactory way to do this is to reduce the amount to the lowest possible minimum. This is accomplished by refrigeration of the air admitted to the air cylinders of the blowing engines, a process patented by James Gayley and accomplishing greater economical results than was estimated possible in that direction.

In the Gayley process the air is passed in contact with cold pipes to relieve it of moisture by freezing. The dry air thus made is then blown through the tuyeres. When it is remembered that in a large modern blast furnace, such as those used in the Pittsburgh district, about 40,000 cubic feet of air per minute is required to maintain the tremendous combustion, it is easy to understand that on days when the humidity is high several hundred gallons of water per hour will be carried into the furnace if undried air is supplied. This water has to be steamed and decomposed, imposing a burden of wasted energy on the furnace. The critical point of temperature in the blast furnace is about 2750° F. If damp air is supplied at a temperature of 1500°, large fuel consumption is needed to maintain temperature above the critical point at which the iron is fused. With perfectly dry air at 2000° F. the demand upon the coke fuel is markedly lessened. Not only is fuel saved, but a higher temperature is so easily made that tendency to slow down is removed and production increased. There is a wider working margin of temperature. Hearth temperature with ordinary hot blast is about 1600 B. T. U. per pound of coke; with 50 per cent of oxygen it rises to about 2400 B. T. U., so that with 50 per cent oxygen blast an ore that would use 2,100 pounds of coke is fused with 1,400 pounds.

Iron Ores.— Such ores are smelted when containing from 40 per cent and upwards of iron, and, in case of calcareous ores, even lower grade material has been treated profitably, but the costs of manufacture increase very rapidly as the yield of metallic iron drops in the mixture. It is, therefore, important to give attention to the preparation of the ore before smelting, with the view of removing objectionable elements. This concentration frequently removes considerable phosphorus which is practically unaffected by the smelting process, and occasionally reduces the sulphur, which is always a difficult and expensive element to remove.

In concentration, it is usually necessary to crush fine, and, as the ore grains decrease in size below what would stay on a 60-mesh sieve, the difficulty of smelting increases; hence two methods are used to agglomerate this fine product and thus render it more easily and economically smelted.

One is briquetting either with or without binder; in the latter case, it is necessary to burn the product in a continuous furnace. The other is nodulizing, that is, agglomerating by use of the rotary kiln. This latter process practically removes all the sulphur that occasions any trouble in the smelting, breaking up sulphates as well as sulphides. Ores carrying 6 per cent of sulphur contain, after such treatment, less than 3-10 of 1 per cent. Some ores, principally the soft brown hematites, found quite abundantly in the Southern States, are best concentrated by washing.

Fuels.— For the blast furnace, coke (q.v.) is to-day the most commonly used, on account of the wide distribution of coking coals, but anthracite is still used largely by the plants within easy radius of the anthracite fields of Pennsylvania and charcoal is still used where timber is abundant.

The development of the retort oven, particularly with the saving of by-products, has made possible the coking of coal that is practically non-coking in the ordinary beehive oven. At the same time, it has reduced the cost of coking considerably, depending upon the nature of the coal and the market value of the by-products at the ovens.

With fuel, as with ores, it is important to eliminate earthy impurities before the smelting operation. It is therefore found advantageous to wash coal that is high in sulphur and ash.

By-product coke lacks the silvery color of beehive coke and is not quite as efficient in the blast furnace, pound for pound of the carbon contents. It is also frequently high in moisture, due to faulty methods of quenching. But since the advent of higher blast temperatures these disadvantages are largely overcome and the use of this coke increases.

In order of efficiency in the blast furnace, charcoal comes first, next anthracite, beehive coke, retort coke.

Small furnaces operate with lower fuel consumption on anthracite than on coke, and it is always necessary to lighten the burden when changing such furnaces from anthracite to coke fuel. Other things being equal, the fuel with high combined carbon is more efficient in the blast furnace than one of lower carbon content. For example, the best coke from the Pocahontas region is more efficient than the best Connellsville; the former, while a soft coke, has from 5 to 7 per cent of ash, while the latter, although hard and silvery, has from 10 to 12 per cent of ash.

Fluxes.— Purity is here a desideratum as well as in ores and fuels, but the only way it can be obtained is by choosing as pure a deposit as possible, then strip off the overlying earth carefully and, in quarrying, throw out stratas or dykes of silicious material.

It is important that the flux for the furnace be crushed to conform with the average of the stock, which ordinarily means broken to pass a three-inch ring.

Both dolomite and calcite are used as flux; the latter is a more active desulphurizing agent but does not make as fluid a slag, and this lack of fluidity offsets to a large extent its greater affinity for sulphur. The greater fusibility of dolomite slag increases the opportunities of calcium present to combine with the sulphur, and hence, as a rule, one flux is as efficient as the other, as a purifying agent in the blast furnace process.

Throughout the South dolomite is used when basic pig is desired and calcite when foundry iron is sought. In other words, dolomite is found to give low silicon and low sulphur, while calcite gives higher silicon in the pig.

Blast Heating.— Each furnace should be equipped with blowing engines capable of delivering the full quota of air at 30 pounds pressure, if necessary, and provided with governors to give a constant speed without regard to the pressure of the blast. This practice has been one important cause of the very large production obtained for American blast furnaces, and has been adopted by some of the English iron masters after remodeling their plants.

The volume of the blast required for a modern stack is 85 cubic feet per minute for each ton of pig made per 24 hours, and weighs nearly one and one-half times all the solid materials charged into the furnace, hence any variations in the quantity or temperature of this blast acts quickly upon the smelting process going on in the furnace.

In the desire to return as much heat as possible to the furnace, the use of the iron-pipe stove, where the maximum temperature of the blast is limited to 950° F., has been superseded by the firebrick stove, where the temperature is only limited by the refractory quality of the firebrick lining. The iron-pipe stoves have the advantage of maintaining a nearly constant temperature of the blast so long as there is gas enough to fully supply the burners in the stove setting, but has the disadvantage of cooling off very rapidly when blast is taken off the furnace for any purpose. Firebrick stoves drop in temperature from 50° to 250° F. from the beginning to the end of an hour's blow, the usual period, but hold their heat when closed up tightly during a shut-down of the furnace for a short period.

It is a good practice to maintain the temperature of the stoves 200° hotter than the blast going into the furnace as a reserve to be called upon should the furnace turn cold. With blast at constant volume and temperature there is still another variable which needs controlling, and that is the humidity of this blast.

The humidity of the atmosphere may vary from nine grains in the summer to as low as one grain in the winter, and between these extremes the humidity varies widely and rapidly during even a few hours of any day. Just the importance of this variable to furnace operation was never demonstrated until Mr. James Gayley constructed at the Isabella furnaces in the year 1904 his desicating apparatus to furnish dry air for that plant. This trial showed that with blast at less than two grains of moisture per cubic foot, a saving of 20 per cent of the fuel required per ton of coke was effected.

Gas.— The waste gases issuing from the furnace consist principally of nitrogen, carbonic oxide (CO), carbonic acid (CO_2) and water in the form of steam.,

The ratio CO and CO_2 indicates the character of the combustion taking place in the furnace hearth, the larger percentage of CO_2, the better the combustion and the lower the fuel consumption. A good average ratio for the United States is CO-2 and CO_2-1, that is (2 to 1). In rare instances it has been as low as 1½ to 1, but with a hot furnace making foundry or high silicon pig, it may reach 4 to 1, or in speigle manufacture from 10 to 15 to 1, depending on the mixture being smelted.

To obtain the maximum economy in iron smelting, every effort is made to utilize the heat units escaping in the waste gases. This is accomplished in two ways. One portion is used in heating the blast, as already described, and the remainder is burned for power, either under water-tube boilers, for the generation of steam, or in the cylinder of gas engines, about 65 per cent of the total waste gas produced being usually available for this purpose, and the balance, 35 per cent, going into the stoves for heating the blast.

The modern furnace is a large producer of power in excess of its own requirements, especially when the gas is utilized in gas-driven engines. Such engines may furnish the blast required and electrical energy for distribution about the furnaces, providing also an excess for sale or distribution elsewhere, amounting to 800 H.P. per ton of pig per hour.

Cinder or Slag.— This by-product in the manufacture of pig iron is a silicate of the oxides of the metals not reduced in the process. Various attempts have been made to utilize this material, and it is quite extensively used for road-making and for railroad ballast. For this purpose it is frequently run when hot onto an endless chain of cast-iron pans and discharged, broken and chilled, in cars for distribution. This method has the advantage of making the surface of the slag vitreous and thus impervious to water.

The most remunerative use for furnace slag of certain composition is in the manufacture of slag cement. For this purpose the slag must not be over 4 per cent in magnesia and from 12 to 14 per cent in alumina. Two kinds of slag cement are manufactured, the ordinary Puzzolan, made direct from the slag without reburning, and slag Portland cement, made by clinkering the slag in a rotary kiln and then grinding. When slag is intended for cement purposes it is granulated, that is, run while hot into water, which breaks it up in the form of sand. Such material is also useful to replace sand in making concrete.

The quantity of slag made per ton of pig produced varies from 600 pounds per gross ton of pig to 3,000 pounds and over. The slag has an important bearing on the quality of the pig made and is one of the great purifying agents of the blast furnace. The greater part of the furnace slag produced, however, is unutilized and is usually tapped into iron cars, called ladles, and hauled in the fluid state to the bank, where it is poured out.

Modern practice seeks to reduce the loss of iron in slag, which is considerable, consisting in part of metal chemically held in the slag as a leso oxide, and fine shots of metallic iron suspended in the slag.

Iron Product.— This metal is a crude carbide of iron, containing about 94 per cent of metallic iron, from 3.25 per cent to 3.75 per cent of carbon and graphite, silicon varying usually from ½ per cent to 4 per cent, and sulphur usually from .01 per cent to .10 per cent, while the phosphorus in Bessemer pig is less than .10 per cent and in low phosphorus pig down to .03 per cent, and in basic from .10 per cent to 3 or 4 per cent, depending on the ores used. In the manufacture of pig iron, it is possible to vary the percentage of carbon somewhat and the proportions of carbon to graphite.

It is also possible to control the sulphur, and the silicon, but the phosphorus must be controlled solely by the choice of the materials charged. This choice also influences the formation of other elements under discussion, but in case of phosphorus, it is the *only* means for effecting such control or regulation.

Practically all of the phosphorus contained in the fuel flux and ore passes into the product, except a loss when making high silicon foundry iron of about 7 per cent by volatilization, and this loss may be increased to 10 per cent in the manufacture of speigle.

The usual way of handling the pig product is to run the metal while hot into moulds made in sand, forming a runner called a sow and short branches about three feet long, called pigs.

In case of gray iron, this metal is broken hot, when it has first solidified, and then cooled with water and loaded into cars. This iron has considerable sand adhering to the surface of the pigs, and for that reason is unsuited to melt in the open hearth furnace, where the lining is made of basic material. In order to obtain iron free from sand, and to reduce the arduous work of breaking this product hot, and carrying same by hand into cars for shipment, various devices have been constructed.

The Uehling pig machine is the most common device employed to make sandless pig. It consists of an endless chain of moulds, which are filled at one point and, after spraying with water, discharge the pig into a transverse pan conveyer, which carries the pig under water, where it is thoroughly cooled and afterward is delivered into cars for shipment.

Another form is provided with moulds and pans made of soft flange steel, and these when filled pass into a tank where they are submerged, the metal cooled and then delivered into cars. Still another form consists of a substantial turntable on which the moulds are mounted.

When it is not necessary to obtain sandless pig, the mechanical pig breaker is used. In the operation of this device the metal is cast in sand and the whole bed is removed mechanically by a traveling crane or trolley to the breaker, where the pigs are broken and fall into cars.

With the pig machines the metal must be first run into cars or ladles, from which it is poured into the machine; but with the pig breaker no ladles are required, the metal going direct into sand beds, as when it is to be handled by hand. Sandless pig may also be obtained by equipping the cast house with cast iron moulds or «chills,» which are washed with loam while hot, thus making it easy to lift the pig when it is cooled.

Blast Furnace Lines.— In the blast furnace the hearth represents the grate surface, and its area determines the amount of fuel burned per unit of time, hence, the production of the furnace. The top of the furnace controls the distribution of the charged materials, and has an important bearing on the working of the furnace, the character of the combustion taking place in the hearth, and hence the burden or amount of charge the coke unit is capable of carrying in smelting.

The bosh determines to a large extent, depending upon its height and angle of slope, the regularity of the working of the furnace, by assisting or retarding the descent of the charge in the smelting zone.

The largest furnaces in the United States are built with the hearth and top diameters practically equal, 17 to 18 feet, while the diameter of the bosh is usually 22 to 23 feet, the bosh height 12 to 14 feet, and the angle of the slope approximately 78°.

The tendency of the last five years has been to increase the furnace diameters, while the bosh has been slightly lowered in proportional height. These changes seem to cause the stacks to work with greater regularity, and larger outputs on burdens composed, largely, of fine ore, and, at the same time, the loss of ore in flue dust has been materially reduced.

Modern practice aims at increased efficiency in all directions. It seeks to increase the effectiveness of the hot blast stoves by reducing radiation; for this purpose larger checker surfaces are exposed to the gases than formerly. The power plant utilization of gases formerly wasted is gaining more attention. There is also a tendency to save the heat lost in molten iron and slag, by using it to make steam for low-pressure turbines. Recovery of the flue dust of the blast furnace is more common. The distribution of incoming ore at the furnace is found to be much more important than used to be supposed. Peculiar ores require to be distributed through the mass, so that the furnace will have a uniform ore to work upon at all times, giving a more constant furnace burden. Improved bin systems are used for ore, coke and limestone flux. It is now universally recognized that to secure steady large product there must be an even distribution of lumps and fines in the furnace. This is accomplished by rotating furnace buckets and also by rotating the furnace top. The revolving principle secures a spiral distribution of the lumps and fines.

Workmen are subjected to less danger around the blast furnace than formerly. The Carnegie Steel Company was the first to successfully plug the tap-hole of a blast furnace with a clay gun, using the blast of the furnace as power. The gun is mechanically swung into position, so that no workman need be near until the hole is well plugged. Other mechanisms tending to increased safety of workmen are in use.

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BLASTING, the technical term for splitting and breaking up any object by means of gunpowder or some other powerful explosive. The operation, which is of extensive use in quarrying, mining and other branches of engineering, is performed by boring a hole or tunnel in the substance to be exploded, by means of a drill, sometimes called a jumper, loading it with gunpowder, and igniting this by means of a fuse burning so slowly as to allow the parties employed to retire to a safe distance before the explosion takes place. At one time it was supposed that the force of the explosion depended on the firm packing of the gunpowder in the hole by means of small chips of stone, sand, etc. One of the most important modern improvements in blasting is the firing of the charge by electricity. This mode is especially applicable to submarine blasting, and was first practised for that purpose by General Pasley, in 1839. The only thing necessary is to make an interruption in the conducting wire at the point where the explosive is placed. In passing the electric current, a spark produced at the interruption fires the charge. The effect being instantaneous the operator can fire any number of charges on the same wire simultaneously.

Two classes of explosives are used in blasting: low explosives, fired by direct ignition; and high explosives, fired by an intermediate detonator. To the first class belong the ordinary black blasting powders. These differ from common gunpowder in being required to produce a more rapid explosion. To this end a larger proportion of saltpetre is used. The quickest formula is 76 parts saltpetre, nine parts sulphur and 15 parts charcoal, in use in England and America. At the other end of the scale is the blasting powder of Austria — 61 parts saltpetre, 18 parts sulphur and 21 parts charcoal. Chief among the high explosives in use for blasting is dynamite, or some one of its many variations. Blasting gelatine and gelatine dynamite are also in favor for certain kinds of work. The first consists of 92 parts of nitro-glycerine and eight parts of collodion cotton; the second of 80 parts of blasting gelatine and 20 parts of woodpulp or other similar absorbent. Fatalities resulting from blasting in coal mines have led to the invention of a series of explosives known as «safety powders.» There are three classes of these; the first containing large quantities of volatile salts — the water of crystallization of these salts lessening the temperature of the explosion, as with the «Oliver Flameless Powder.» The second class are the nitrate of ammonia powders, which give very little flame. The third class are nitro-glycerine powders in which the explosive is so combined with other ingredients as to give a very short flame and a low temperature, as with «Carbonite.» As compared with black powder, carbonite may be used with the same degree of safety in loads of 200 pounds as with one pound of common black blasting powder.

In mining work single-hand boring is the common practice — that is, each miner holds his own drill as well as striking with the hammer. In quarries, however, and large excavation work sets of two or three men work together, one handling the drill and the others striking. Where the holes are very deep the weight of a long drill rod is sufficient without the hammer, the rod being lifted two or three feet and allowed to fall. After each blow the drill is lifted a little and turned in the hole. The dust is frequently lifted out to prevent choking. A better plan is to introduce a small running stream of water. For removing small volumes of rock in mines, quarries and other engineering enterprises at a single blast, small-shot blasting is the most common method employed. This consists of drilling a small number of holes in the rock from one and one-quarter to three inches in diameter and from 18 inches to several feet in depth which are then filled with dynamite or blasting-powder or some other safe and easily handled explosive, and properly connected by fuse, or with a magneto-machine or electric battery by electric wires. The space above the explosive is then plugged up with sand, dirt, clay or other matter, and the charge exploded. For breaking the rock into small pieces so as to be more easily removed (as in excavating for a foundation) the holes are drilled close together and heavily charged, but where it is unnecessary to break into small pieces (as in quarrying), and large shapely masses are more desirable, the holes are drilled in rows with greater distance between and filled with a smaller amount of explosive. This will split the rock practically along one line and will not shatter it as in the first case. In excavating tunnels, it is in many cases desirable to remove a mass of rock the size of the tunnel cross-section, an object which is generally accomplished by drilling and firing a small number of converging holes, thus forming and removing a cone-shaped or wedge-shaped centre-core. This central opening thus formed is enlarged by drilling and blasting successive rings of holes around it.

For removing vast quantities of rock or blowing up ledges, the best method is mine blasting. For this purpose shafts are sunk either vertically, or horizontally, or both, into the ledge to be removed; enormous quantities of powder, dynamite or other explosives are placed at the bottom or end of the shafts, which are then closed up by rocks, earth, etc., and the charge is fired either by fuse or by electricity, most generally the latter.

The first blasting on record was in 1627, in a mine in Schemnitz, Hungary, by Caspar Weindl, a Tyrolese miner. From that locality the practice spread slowly, reaching England in 1670, and being introduced in the Cornwall mines in 1689.

One of the greatest mine blasting operations ever attempted was the removal of Flood Rock in that section of the East River, New York, known as Hell Gate. An entrance shaft was sunk on the Long Island shore, from which the reef projected. From this shaft nearly 20 tunnels were bored in all directions, and connected by lateral galleries. The rock covered about nine acres and the tunnels were made large enough for the broken roof to fall into them and leave 26 feet of water in the channel. The roof left above the tunnels varied from 10 to 18 feet in thickness. The charge consisted of 240,399 pounds of rackrock powder and 44,331 pounds of dynamite distributed in over 46,000 holes. The explosion was measurably successful, the dredging necessary afterward being readily accomplished. Other great blasts on record are: the blasting off of the face of the mountain of marble at Colonnata, in the Carrara district of Italy, where eight tons of high explosives distributed in tunnels dislodged 600,000 cubic yards of marble; a blast in a hillside at Piedra, Cal., where 114,000 pounds of Judson powder and 11,400 pounds of Hercules 60 per cent dynamite threw down 350,000 cubic yards of rock; a blast at Tennino, Wash., to get rock for a government jetty, where 43,100 pounds of blasting powder and 1.200 pounds of 60 per cent dynamite broke out 220,000 cubic yards; and a blast at Tompkins Cove, N. Y., where 23,575 pounds of 60 per cent gelatine dynamite and 26,550 pounds of granulated nitro-glycerine powder broke out 210,000 cubic yards of bluestone.

Surface blasting is generally used to remove reefs and obstructions to navigation, high explosives such as dynamite, gun-cotton or nitro-glycerine being the only effective agencies in an unconfined space, as the detonation is so sudden that the shock is instantly transmitted to the rock with which it is in contact. Numerous important improvements have been made in blasting by the substitution of rock boring machines for hand labor. Of such machines, in which the jumper or drill is repeatedly driven against the rock by compressed air or steam, being also made to rotate slightly at each blow, there are many varieties.

In recent years blasting has been used scientifically in the improvement of farming land. Stumps are blown out, boulders broken up, hardpan shattered, subsoils loosened, drainage crevices opened in low and wet spots, ditches cut, gullies filled, etc. Holes are blasted out for setting young fruit trees, loosening the subsoil advantageously for several feet, and old trees are restored to vigorous growth and bearing by the judicious firing of blasts in the subsoil between old orchard rows. Worn out land has been revitalized by blasts set 15 feet apart and three feet deep, at a cost of $18 per acre, the good results remaining for several years. See also Explosives.

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BLASTODERM. See EMBRYOLOGY.

BLASTOMERYX. See MERYCODUS.

BLASTOMYCOSIS, a rare skin disease due to a fungus parasite. See SKINS.

BLATCH, Harriet Stanton, American lecturer and suffragist: b. Seneca Falls, N. Y., 20 Jan. 1856. She is a daughter of Henry Brewster and Elizabeth Cady Stanton. She was graduated at Vassar College in 1878, and later studied in Berlin and Paris. In 1882 she was married to William Henry Blatch of Basingstoke, England. She resided in England for 20 years and became interested in the work of the Fabian Society. She was also active in all women’s organizations and particularly in the suffrage movement. She assisted Charles Booth in collecting facts on village life in England, and her studies in this field were embodied in a thesis for the degree of M.A. at Vassar in 1894. In America she has continued her mother’s work for the political enfranchisement of women. She is president of the League of Self-Supporting Women and of the Women’s Political Union.

BLATCHFORD, Samuel, jurist: b. New York, 9 March 1820; d. Newport, R. I., 7 July 1893. He was graduated at Columbia University in 1837; became secretary to Gov. W. H. Seward of New York, and practised law at Auburn, N. Y., as a member of the governor’s firm, 1845–54. In 1854 he settled in New York as head of the firm of Blatchford, Seward & Griswold. Though he attained success in general practice, it was his application to admiralty law that gave him his widest repute. On 3 May 1867 he was appointed judge of the United States District Court for the southern district of New York; in March 1878, judge of the United States circuit for the second circuit; and in March 1882 he became an associate justice of the United States Supreme Court. Here he continued to give close attention to admiralty cases, and also rendered important decisions on bankruptcy, copyright, patent and libel cases. He was highly esteemed for his learning, courtesy, patience and skill. Publications: ‘Reports of Cases in Prize in the Circuit and District Courts for the Southern District of New York 1861–65’ (1866); ‘Reports of Cases in the Circuit Court of the United States, Volumes 4–6’ (1867–69); ‘Circuit Court Reports for the Second Circuit, 1847–75’ (12 vols. octavo); ‘Reports of the Circuit Courts of the United States, Second Circuit, Volumes 13–20’ (8 vols., New York 1877–83); with E. Howland and E. R. Olcott, ‘United States District Court Reports (Admiralty Cases Decided by Judge Betts) for the Southern District of New York, 1827–47’ (2 vols., New York).

BLATCHLEY, Willis Stanley, naturalist: b. North Madison, Conn., 6 Oct. 1859. He was graduated at Indiana State University 1887, and was successively an assistant on the Arkansas Geological Survey 1889–90, a member of Scoville’s scientific expedition to Mexico 1891, and assistant on the United States Fish Commission in 1893. In 1894 he was elected State geologist of Indiana, and re-elected in 1898, 1902 and 1906. Besides his annual reports his scientific writings include ‘Gleanings from Nature’ (1899); ‘Locustidæ and Blattidæ of Indiana’ (1892); ‘Some Indiana Acrididæ’ (1891–98); ‘A Nature Wooing’ (1902); ‘Orthoptera of Indiana’ (1903); ‘Boulder Reveries’ (1906); ‘The Coleoptera of Indiana’ (1910); ‘Woodland Idylls’ (1912); ‘The Indiana Weed Book’ (1913); ‘The Rhyricophora or Weevils of Northeastern America’ (1916).

BLATTIDÆ, family of cursorial Orthoptera, of which the ordinary cockroach is the most familiar. The family are the oldest known insects, being found as fossils in the middle Silurian deposits of France. See COCKROACH.

BLAUBOK, blow’bŏk, or **BLUEBUCK,** a large antelope of South Africa (*Hippotragus leucophœus*). It was of a bluish hue, and had long, stout horns which swept back from its forehead like those of its relatives, the isabel and equine antelopes. It formerly occurred in large herds, but had a limited habitat, and is extinct since 1799. Only five mounted specimens are known, these may be seen in the museums of Leyden, Paris, Stockholm, Upsala and Vienna. Closely related to this buck is the sable antelope (*Hippotragus niger*) from the eastern Transvaal and Mashonaland. When wounded or brought to bay it is a very dangerous animal. It breeds readily in captivity and becomes quite tame. Another species is the equine antelope (*H. equinus*), whose habitat is all Africa south of the Sahara, except the Kongo forest. It is of a pale-brown color with vari-colored face. Baker’s antelope (*H. bakeri*) is by some regarded as a subspecies of the equine, by others a distinct species.

BLAURER, blow’-rėr, **BLARER,** or **BLAARER, Ambrosius,** German reformer: b. Constance, 12 April 1492; d. Winterthur, Switzerland, 6 Dec. 1564. Through the influence of his brother Thomas he went over to the Reformation party and went to Constance in 1522, after a vain attempt to introduce the doctrines of Melanchthon and Luther into the monastery to which he then belonged. He began to preach in Constance in 1525 and soon became the leader of the Reformation there. He was very active. He was at the colloquy in Berne (6 Jan. 1528) at Memmingen (1528 and again the following year); and at a third meeting in the same place in 1531. Shortly afterward in the same year he was at Ulm and afterward at two separate conventions at Geislingen and at two others at Esslingen (1531 and 1532); and everywhere his ability to organize was of great value to the Protestant cause. The following year he scandalized the Catholic party by marrying a former nun (1533). A year later he was summoned (with Erhard Schnepf) to Würtemberg by Duke Ulrich and was sent to Tübingen; but in 1538 he lost his position through court intrigue. He went to Kempten and later to Isny. The Spaniards finally took Constance (6 Aug. 1548) and crushed the Reformation; and Blaurer, forced to leave, went to Biel (1551–59), Leutmerken and Winterthur, where he preached and carried on a very extensive correspondence with the leaders of the Reformation which had considerable influence in shaping its course and doctrine. In addition to his extensive prose works, which are all of an ecclesiastical or doctrinal nature, he also wrote a number of excellent hymns.

BLAUVELT, blow′vĕlt, **Mme. Lillian Evans,** American prima donna: b. Brooklyn, N. Y., 16 March 1874, of Welsh, English and Dutch ancestry. When eight years old she made her début as a violinist. She studied (voice) with M. Jacques Bouhy of Paris, for three years. Her début in opera was made at the Théâtre de la Monnaie, Brussels, in ‹Mireille.› Returning to the United States, her work was chiefly in concert and oratorio under Seidl, Thomas, Damrosch, etc. She has sung before nearly all the crowned heads of Europe and possesses many royal decorations; received decoration of the Order of Saint Cecilia in Rome, 7 April 1901 (only woman ever so honored). In 1902 sang by special command at Albert Hall, London, the Coronation Ode, receiving the coronation medal from King Edward VII. Appeared at Royal Covent Garden, London, in the rôles of Marguerite in ‹Faust,› Juliette in ‹Romeo and Juliette,› Zerlina in ‹Don Giovanni› and Michaela in ‹Carmen› in 1903; toured Great Britain and Ireland in 1904; Germany and Russia in 1905; and continued to make annual appearances in various European countries until the summer of 1914 when through the great war she was not permitted to fill her engagements.

BLAVATSKY, blạ-väts′kẹ, **Helena Petrovna,** Russian theosophist: b. Ekaterinoslav, Russia, 1831; d. London, 8 May 1891. She traveled in all parts of the world and succeeded in entering Tibet. In 1873 she came to the United States, founded the Theosophical Society in New York, and aided in establishing *The Theosophist.* She studied the East Indian esoteric doctrines and Buddhist philosophy, and by her writings contributed to make this philosophy popular among foreigners and Indians. Her miraculous pretensions have been proven impostures by V. S. Solovyoff in ‹A Modern Priestess of Isis› (Eng. trans. by W. Leaf, London 1895), and also by the investigations of the Society for Psychical Research in 1884. Despite her imperfect knowledge of Sanskrit, she wrote much on the ancient doctrines of India. At the time of her death she had about 100,000 followers. She wrote ‹Isis Unveiled›; ‹The Secret Doctrine›; ‹Key to Theosophy.› An abridgment of her works was edited by Katharine Hillard in English (New York 1907). Consult Olcott, ‹Old Diary Leaves› (New York 1895). See THEOSOPHY.

BLAYDES, blāds, **Frederic Henry Marvell,** English classical scholar: b. 29 Sept. 1818; d. 7 Sept. 1908. He was graduated at Christ's Church, Oxford, in 1840, was ordained to the priesthood, and held the living of Harringworth, Northamptonshire, 1843–86. His leisure was absorbed in classical study, and he edited a series of works, with critical notes, emendations and commentaries,, elucidating the plays of Aristophanes and Sophocles. He reckoned that he had given more than 20 years of his life to the latter author, and, with intervals, more than 50 years to the former.

BLAZING STAR. Various hardy perennial plants. See LIATRIS.

BLAZONRY, the art of describing a coat of arms in such a way that an accurate drawing may be made from the verbal statements given. To do this a knowledge of the points of the shield is particularly necessary. Mention should be made of the tincture or tinctures of the field; of the charges which are laid immediately upon it, with their forms and tinctures; which is the principal ordinary, or, if there is none, then which covers the fess point; the charges on each side of the principal one; the charges on the central one, the bordure — with its charges; the canton and chief, with all charges on them; and, finally, the differences or marks of the cadency and the baronet's badge. See HERALDRY.

BLEACHING, the process of decolorizing textile fibres and fabrics, papers, oils, waxes and other substances so as to leave them white. The operations of bleaching are essentially chemical, the whitening being accomplished in two ways: (1) By the oxidation of the coloring matter in the substance to be bleached — in which case the coloring matter may be itself whitened or may only be rendered soluble, to be afterward washed away; and (2) by the hydrolizing of the coloring matter, so that it forms a white or colorless compound, remaining harmlessly in the substance if it is insoluble. In the first instance nascent («new born») oxygen is the agent employed; in the second, nascent hydrogen. Speaking in a general way the oxidizing processes are used for vegetable substances, and the hydrolizing processes for substances of animal origin.

The chemical agents employed in commercial bleaching fall naturally into these two classes. Foremost of those which liberate active oxygen in the bleaching bath is chlorine, either as such or in combination as hypochlorous acid. Practically all the cotton bleaching in the United States is done with this agent. Up to a very recent period the form in which it was applied was as the so-called «bleaching powder,» a chloride of lime. The commercial production of liquefied chlorine has led to the preferable use of sodium hypochlorite, formed in the bath by passing into a solution of soda ash or soda caustic the gaseous chlorine which vaporizes from the liquid form when the pressure is released. This gives a clear solution free from the very objectionable sediment common to the lime bath. Other oxidizing agents in large use are the peroxides of hydrogen and sodium. Both of these are very unstable, and require to be kept cold and in the dark until used. When warmed they give up their loosely combined oxygen. Sodium perborate is a substance of similar properties. Ozone, formed by passing a silent electric discharge through confined air, is an effective bleaching agent especially for yarns; it is discharged into the bath as it is made. The so-called electrolytic process consists in decomposing a bath of sodium chloride in which the goods to be bleached are immersed, by the passage of an electric current. The chlorine made in this way costs about one-fifth as much as that obtained from bleaching powder. Potash permanganate is another oxidizing agent, used extensively for bleaching straw, jute and even ivory. These substances acquire a brownish color in the process, but this disappears in a bath of sodium bisulphite.

The agents used in bleaching by the action of free hydrogen in the bath are sulphur dioxide, the bisulphites of soda and potash, and the alkali hyposulphites.

Bleaching is now a very different procedure from what it was in the 18th century. At that period several months were required to bleach a piece of cloth. Manufactured linens were then sent by the shipload to Holland in the spring of the year, to be bleached on the grassy plains of that country, not to be returned until fall. The process there consisted in boiling repeatedly at intervals in caustics and lyes, and exposing the fabrics to the sunlight between the boilings. After the discovery of the bleaching properties of chlorine gas by Berthollet in 1790, the time required for bleaching was reduced from several months to a few days. To some extent, however, the old processes are still continued in certain localities.

In modern bleacheries the process is twofold: First, a preliminary cleansing of the material to be bleached; second, the actual whitening.

In the case of fabrics the procedure in the bleaching of cotton cloth may be cited as a typical example. The steps are nine in number, as follows: (1) Singeing; (2) steeping; (3) boiling with lime; (4) souring; (5) boiling with soap; (6) boiling with lye; (7) chemicking; (8) souring; (9) washing thoroughly.

The singeing is to remove the long fibres which protrude from the surface of the cloth and make it woolly. It is done by rapidly passing the cloth very close to a gas flame. Steeping is for the purpose of fermenting certain organic substances in the walls of the fibre, and thus rendering them soluble. It is carried on with warm water (140° F.) for from 18 to 24 hours, and in some bleacheries diastase is added to the bath to hasten the fermentation. The cloth is well washed, and then boiled for 12 hours in milk of lime. This is to break down certain refractory compounds which were not affected by the ferment. Again the cloth is washed, and then placed in the «sour.» This is a bath containing hydrochloric acid, which dissolves any particles of lime remaining in the fibres. This occupies six to eight hours and then another washing ensues. There still remain, however, substances which the lime did not remove, and these are attacked with a «soap boil» in which the active ingredient is a soda-ash and resin soap. The boiling in this bath is continued from six to eight hours, and is followed by another washing. The next boiling is still a part of the cleansing process, and is done with a mixture of caustic soda and potash lye in solution. When the cloth has been well washed again it is ready for the bleaching proper, and goes into the «chemic.» In most bleaching plants this chemic will be made of bleaching powder (hypochlorite of lime) with a little acid added. The chemical action which takes place is the setting free of hypochlorous acid in the bath, and this substance in the presence of organic matter (in this case the cotton fibre) parts with its loosely combined oxygen, which combines with the coloring matter remaining in the fibre, and either forms a soluble oxide which is washed out subsequently, or turns it into a white or colorless compound, which is not objectionable. The chemicking requires from six to eight hours. The fabric is then washed, and placed in a «sour» made this time with dilute sulphuric acid. It is left here until every trace of lime has been dissolved out, and then the cloth receives a final and prolonged washing, or rather, series of washings in which one contains a little softening soap, and another a weak bluing. It then goes to the drying house as finished.

The bleaching of linen follows closely the process used for cotton, but the solutions are made weaker, and the operation is prolonged by repetitions of the chemicking, alternating with alkaline baths. For linen yarns, the ozone process is especially adapted. A newly invented process for linen known as the Peckham process, from its inventor, first boils the fibre in a solution of benzole in a soap made from cottonseed oil. It is then thoroughly washed and dried, and then bleaches rapidly in a very dilute solution of sodium hypochlorite. Hemp is well boiled with carbonate of soda, or an alkali silicate, or both, and is bleached in a chlorine bath. The operation is repeated several times until the fibre is white. For hemp, the strength of the chlorine bath is 2/10 of 1 per cent. Jute is first boiled in a warm soapy solution and then immersed in a weak alkali silicate, to avoid corroding the fibre. It is then bleached in a weak chlorine solution, not above a strength of 1/10 of 1 per cent.

The electrolytic method of producing chlorine in the bleaching bath is of special value in handling cotton and hemp and other vegetable fibres in the raw state, also paper stock, cellulose, etc.

For wool, the bleaching agents used are those which liberate hydrogen in the bath, as sulphur dioxide, gaseous sulphurous acid, sodium bisulphite, etc. A newer process uses hydrosulphurous acid. The oxidation process is in use in some bleacheries, potash permanganate being employed, but there is danger that the liberated caustic may damage the fibre.

For silk, sulphur dioxide and sodium bisulphite have long been the dependences. The peroxides of hydrogen, sodium and barium have also been employed. But in the latest practice neither sulphurous acid nor chlorine are permitted. The bleaching bath is made with sodium peroxide, to which is added a little sulphuric acid. Hydrogen peroxide is formed in the bath, and the coloring matter being rendered soluble is washed out in the subsequent washings. The same bath is used for mixed goods of silk and cotton. Scouring the silk before bleaching has been done away with by the addition of glycerine to the bleaching bath. Bluing the fibre is now done before the bleaching, instead of afterward, as formerly.

Fats and animal oils are bleached with sodium hydrosulphite, and this agent is equally effective with seed oils if a percentage of formaldehyde is added. Wax is bleached by stirring 10 per cent of fuller's earth into the melted wax, and then raising the temperature to about 300° F., not higher. The same process is employed for paraffin wax. Soaps are bleached by adding about 1/5 of 1 per cent of pure anhydrous sodium hydrosulphite, stirring it into the boiling soap. As this salt does not keep, it must be freshly prepared when needed.

For feathers, hair, sponges, leather and ivory the bleaching agent employed is hydrogen peroxide.

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BLEACHING MATERIALS, the various substances used in bleaching or fading out coloring matters from cotton, linen, wool, silk or other fabrics. They embrace chloride of lime or bleaching powder, chloride of soda, and other hypochlorites, hydrogen peroxide (or dioxide), sodium and other peroxides (or dioxides); bisulphites of soda, lime, etc., chlorine, sulphur dioxide, lime-sulphur solutions, etc. The United States Department of Commerce reports 51 establishments engaged in the manufacture of bleaching materials for sale in the United States in 1914. The total value of products made for sale in 1914 was $4,964,403, an increase of 54.4 over the corresponding figure for 1909.

Hypochlorites constitute the most important class, the production in 1914 aggregating 222,152,000 pounds, valued at $2,578,269, and exceeding that of 1909 by 90.2 per cent in quantity and 44.3 per cent in value. This class consists principally of chloride of lime, but also includes relatively small quantities of chloride of soda and other hypochlorites. A large amount of these products is made electrically. Of the establishments reported for 1914, four were located in New York, two in Michigan, and one each in New Jersey, Pennsylvania and West Virginia.

Hydrogen Peroxide, or **Hydrogen Dioxide** (H_2O_2) was produced to the extent of 32,594,807 pounds, valued at $1,303,596. There are nine establishments engaged in this branch of the industry in New York, three in New Jersey, two in Illinois, two in Missouri, and one each in California, Connecticut, Minnesota and Pennsylvania.

Bisulphites of soda, lime, etc., are manufactured by 14 establishments. The production in 1914 was 26,346,000 pounds, valued at $243,559, a decrease of 16.9 per cent in quantity, but an increase of 7.7 per cent in value as compared with the output of 1909. The 14 establishments are distributed as follows: five in Massachusetts, two each in New Jersey and Pennsylvania, and one each in Delaware, Missouri, New York, Ohio and Wisconsin.

The production of chlorine in 1914 was 12,217,000 pounds, valued at $472,836, by seven establishments, of which three were located in New York, two in Michigan, and one each in Georgia and Illinois. The output of other bleaching materials, including sodium peroxide, sulphur dioxide, lime-sulphur solutions, etc., in 1914 was valued at $366,143.

BLEAK, or **BLICK** (*Alburnus alburnus*), a small river fish, six or seven inches long, of the carp family. It somewhat resembles the dace. Its back is greenish, otherwise it is of a silvery color, and its silvery scales are used in the manufacture of artificial pearls. It is a good food fish. It is common in the streams of England and the Continent, spawns in May, and is a favorite in the aquarium.

BLEAK HOUSE, a novel by Charles Dickens (1853). Its secondary theme is the monstrous injustice and even ruin often wrought by delays in the old Court of Chancery, which defeated all the purposes of a court of justice. The name is that of the home of Mr. Jarndyce and is said to have been drawn from a house at Broadstairs, Kent, which Dickens occupied in summer.

BLEASE, Coleman Livingston, American public official: b. Newberry, S. C., 8 Oct. 1868. He was educated at Newberry College and at Georgetown University where he received the degree of L.L.B., 1889. The same year he was admitted to the bar; from 1890 to 1898 was a member of the State legislature; senator from 1904 to 1908; and in 1910 and in 1912 was elected State governor. His administration attracted considerable attention owing to his opposition to negro education, his qualified defense of lynchings and his wholesale liberation of convicts.

BLECHEN, bhĕн'ĕn, **Karl Eduard,** German landscape artist: b. Kottbus 1798; d. 1840. Until his 24th year he pursued a commercial career and then studied with Lütke in Berlin and for three years painted scenery for theatres. After studying art in Italy for some years he settled in Berlin in 1830 and became professor at the Academy of Fine Arts there in 1835. The first representative of the Berlin landscape school, he painted ‹Villa Este›; ‹Villa Borghese›; ‹View Near Nemi›; ‹View of Naples›; ‹View at Tivoli›; ‹Camp of the Semnones,› etc. The Berlin National Gallery contains about 60 of his paintings and studies.

BLEDSOE, Albert Taylor, American clergyman and writer: b. Frankfort, Ky., 9 Nov. 1809; d. Alexandria, Va., 1 Dec. 1877. He was graduated at West Point in 1830, became lieutenant of infantry, but resigned in 1832. He was professor of mathematics at Kenyon College and at Miami University, 1833–36, and also in the universities of Virginia and Missippi. He was assistant Secretary of War of the Confederacy, and successively an Episcopal and a Methodist minister. Besides editing the *Southern Review* and contributing frequently to leading literary, scientific and theological periodicals, he wrote ‹Examination of Edwards on the Will› (1845); ‹Theodicy› (new ed., 1853); ‹Philosophy of Mathematics› (1868); ‹Essay on Liberty and Slavery› (1856); ‹Is Davis a Traitor?, or was Secession a Constitutional Right previous to the War of 1861›? (1866), etc.

BLEDSOE, Jesse, American statesman: b. Culpepper County, Va., 6 April 1776; d. near Nacogdoches, Tex., 30 June 1837. When a boy he emigrated to Kentucky and there studied at the Transylvania Seminary, where he became a fine scholar. He afterward studied law and practised with great success. In 1808 he became Secretary of State under Gov. Charles Scott, and in 1812 was a member of the legislature. He was elected United States senator from Kentucky and served from May 1813, till 1815. From 1817 to 1820 he was State senator. In 1820 he was a presidential elector, and in 1822 was appointed circuit judge in the Lexington district. Accordingly he settled in Lexington, where he also became professor of law in Transylvania University. Later he returned to the practice of his profession, in 1833 removed to Missouri, and in 1835 to Texas, where he was engaged collecting historical material at the time of his death.

BLEECKER, Ann Eliza, American poet, daughter of Brandt Schuyler: b. New York, October 1752; d. Tomhannock, near Albany, N. Y., 23 Nov. 1783. She married, in 1769, John J. Bleecker, and moved to Tomhannock, whence she was driven by the news of the approach of Burgoyne's army. Her husband had already left to provide means of escape, when she was obliged to fly on foot, in the midst of her family, and of a crowd of other helpless persons, for refuge from the advancing savages. After enduring great horrors and distresses, they made their escape to Albany, and thence by water to Red Hook, where they remained until the surrender of Burgoyne enabled them to return to their home. Her poems were written as suggested by occasions, without a view to publication. She possessed a sportive fancy, with much tenderness of feeling, but the sad experiences of her life produced upon her such an effect, that she destroyed «all the pieces that were not as melancholy as herself.» Her poems are to be found in the earlier numbers of the *New York Magazine*, and a collection of her stories and «poetics» in a volume entitled 'Posthumous Works of Ann Eliza Bleecker in Prose and Verse,' edited by her daughter, Margaretta V. Fangeres (1793).

BLEEDING, the escape of blood from the arteries or veins. Bleeding may be external, and thus readily seen and prevented by proper surgical measures, or it may take place internally, into one of the large body cavities, and is then a serious matter. The amount of blood that is in the human body varies from one-tenth to one-twelfth of the weight of the individual, and of this from 40 to 60 per cent may be lost without resulting in death from the direct effects of bleeding. Death may result in some individuals from the loss of much smaller quantities, but most persons can lose two-fifths of their blood and not die. Bleeding varies widely in its rapidity. Some wounds ooze, others well-up, and again bleeding may be very rapid when a large vessel has been cut.

Bleeding from a vein or an artery may be recognized by the dark color and regular flow from the former, and the brighter red and spurting or throbbing flow from the latter. If bleeding is taking place while pressure is being applied to a cut, these differences may not be so pronounced. In emergencies bleeding from an artery may be stopped by direct and hard pressure of the carefully cleaned finger immediately over the source of the issuing jet of blood. This pressure must be hard and continued. This will permit time to find the chief artery that is supplying the bleeding vessel, and as soon as this is found pressure upon it will further aid in suppressing the flow. Thus the brachial artery can be found on the inside of the arm by feeling on the patient's well side, and firm pressure on it will stop all bleeding in the parts below, as in a cut wrist or cut hand. Pressure on the femoral artery in the groin will control all bleeding below the point of pressure. As pressure by means of the finger is difficult to maintain, an improvised apparatus may be made of a knotted napkin or large handkerchief. This may be placed about the arm or leg, the knot brought to press on the artery and then by means of a short stick the whole may be made to tightly compress the entire limb. (See TOURNIQUET). Pressure of this kind should not be too prolonged, or serious damage to the parts may result. Venous bleeding is usually controlled by direct pressure of the limb on the side away from the heart and by direct pressure of antiseptic gauze. In oozing, direct pressure of antiseptic gauze or direct application of hot water, 118–120° F., is most effective. Powders, cobwebs, iron, alum, etc., are not advisedly used.

Internal hemorrhage is extremely important, since the blood cannot be seen, and one has to rely on the symptoms solely. These are usually a beginning sense of faintness or weakness, and perhaps some nausea. The extremities commence to get cold and white, the face becomes pale and anxious, and the patient may commence to have air-hunger. He desires the windows to be opened wide, thinking thereby to get more air. Thus the beginning symptoms are very similar to those of a severe fainting spell. But as the bleeding continues there is increasing restlessness with increased air-hunger; there may be cold, clammy sweat over the patient's body; there is sighing to gasping respiration, and the heart-beat is hard to hear and it may be impossible to feel the pulse beat. The patient may die in convulsions, the face becoming deeply cyanosed, and the respirations spasmodic or convulsive in type. If the patient does not die he will have a long, tedious convalescence. Prompt medical or surgical aid is imperative in all such cases. The best temporary stimulant is an enema of hot (118–120° F.) salt solution, one teaspoonful to the pint, which is allowed to run in and out of the rectum, a quart or two at a time.

Bloodletting.— This procedure was one much in vogue in former years, and while still a most desirable operation to perform for certain types of disease, the conditions brought about by its use are now largely induced by other means. In conditions of poisoning, some cases of pneumonia, and in some apoplexies, bleeding is still performed by competent medical practitioners, and is advocated in most manuals of practice. It is its indiscriminate use for all ills that has fallen out of favor.

Bleeders.— Certain individuals have a tendency to bleed inordinately from even the slightest wound. They are called «bleeders,» and are frequently found in families, most of the members of which have like traits. The pulling of a tooth is often followed by continuous hemorrhage. The causes for this idiosyncrasy are not all known. In some an insufficient quantity of calcium salts in the blood has been thought to be the most important cause.

SMITH ELY JELLIFFE.

BLEEDING HEART. See DICENTRA.

BLEEDING HEART YARD, a squalid locality in London, mentioned by Dickens in ‘Little Dorrit.’ The origin of the name is unknown.

BLEEK, blāk, **Friedrich,** German biblical scholar and critic: b. Arensbök, Holstein, 4 July 1793; d. 27 Feb. 1859. He was educated at the University of Kiel, 1812–14, and at Berlin under De Wette, Neander and Schleiermacher. In 1818 he was appointed tutor in theology at Berlin, in 1823 professor extraordinary and in 1829 was appointed professor of theology at Bonn, and spent the remainder of his life there. He was a thorough investigator, impartial in his judgments and clear in his presentations. He was the first to hold the modern views of the Old Testament but clung to the traditional view of the New. His essays on the ‘Origin and Composition of the Sibylline Oracles’ and ‘Authorship and Design of the Book of Daniel’ attracted general notice. He also published a defense of the genuineness of the Gospel of Saint John, which is still regarded as the strongest in the field. His ‘Introduction to the Old Testament’ was translated into English (2 vols., London 1869; reprinted 1 vol., 1875); also the ‘Introduction to the New Testament’ (2 vols., Edinburgh 1869) and ‘Lectures on the Apocalypse’ (London 1875). The ‘Epistle to the Hebrews’ (3 vols., 1828–40) is untranslated. Subsequent editors of this work have ascribed to Bleek views which he certainly did not hold.

BLEEK, Wilhelm Heinrich Immanuel, German philologist, son of Friedrich Bleek (q.v.): b. Berlin, 8 March 1827; d. Cape Town, 17 Aug. 1875. In 1855 he went to South Africa and devoted himself to the study of the language, manners and customs of the natives. In 1860 he was appointed public librarian at Cape Town, and his researches were rewarded with a pension from the civil list. He was principal author of the ‘Handbook of African, Australian, and Polynesian Philology’ (1858–63), his other chief productions being ‘The Library of Sir George Grey’ (2 vols., 1858–59); ‘Vocabulary of the Mozambique Language’ (1856); ‘Comparative Grammar of South African Languages’ (1862); ‘Hottentot Fables and Tales’ (1864); and ‘The Origin of Language’ (1868); ‘Specimens of Bushman Folklore’ (Eng. trans., 1911).

BLEIAZID. Until recently, fulminate of mercury has always been used for detonators in torpedo-charges. The fulminate alone was first used in military pyrotechnics. Afterward it was mixed with other explosive nitrates, such as trotyl, picric acid, tetranitro-methylaniline, etc., in order to increase the force of the initial impulse. In navies, principally, the fact that fulminate of mercury is very porous and cannot explode when wet is a great inconvenience. That is, its easy absorption of moisture, due to its porosity, makes it decrease in density. In its natural state the sensitiveness of lead hydronitride or bleiazid to shock is the same as that of fulminate of mercury. Compressed, it is less sensitive in this regard than the fulminate. Its force of detonation, however, is twice as great. It holds its detonating properties, even when compressed at 6,000 kilograms per square centimetre, while fulminate loses this property at 700 kilograms. It resists high temperatures and is insoluble in water, of a white color, and dustlike in appearance. In making detonators, tetranitro-methylaniline, or «tetryl,» is added to both fulminate of mercury and lead hydronitride. It is a yellow explosive substance, insoluble, stable like trotyl, and is obtained industrially by the nitration of dimethylaniline.

BLEIBTREU, blīp'troi, **Georg,** German artist: b. Xanten, Rhenish Russia, 27 March 1828; d. Berlin, 16 Oct. 1892. He studied at the Düsseldorf Academy and under Theodor Hildebrandt. His first important picture was the ‘Destruction of the Kiel Turner-Corps at Flensburg’ (1852) and his subsequent works are also battle pieces. Among them are ‘Episode from the Battle of Waterloo’ (1858); ‘Battle of Königgratz’; ‘Surrender of Napoleon after Sedan’; ‘Attack of Saxon Corps at Saint Privat’ (1880). In the war with Austria (1866), he accompanied the Prussian armies and in 1870 he was attached to the suite of the Crown Prince.

BLEIBTREU, Karl August, German poet and novelist: b. Berlin, 13 Jan. 1859. He is one of the foremost representatives of the youngest German school in literature, and a pronounced realist. All his views are radical, as shown by the very titles of his works; for example, ‘Revolution in Literature’ (1885); ‘Literature's Struggle for Life.’ He also wrote ‘Dies Iræ’; ‘Napoleon at Leipzig’; ‘Cromwell at Marston Moor.’ His dramas are ‘Lord Byron’ (1888); ‘The Day of Judgment’; ‘The Queen's Necklace,’ etc. He was one of the founders of the *Freie Bühne* in Berlin in 1889. His name was once coupled with that of Nietzsche as one of the most brilliant stars of the naturalistic school. His work shows power, but he has left no well-developed artistic production.

BLEICHRÖDER'S, blīh'rė-dėr, a celebrated banking house in Berlin, established in 1803 by Samuel Bleichröder, who died in 1855, continued by his son, Gerson Bleichröder, who died in 1893, and subsequently by the two sons of the latter. Under the patronage of Bismarck it entered into commercial relations with the Prussian government, rendering material assistance in 1866 and again in 1871. Gerson Bleichröder was raised to the hereditary peerage in 1872. The house is recognized as one of the most important private banking establishments in Europe.

BLEMMYES, blĕm'ĭ-ez, or **BLEMYES,** a people of ancient Ethiopia, who for several centuries after Christ gave much trouble to the Romans during their occupation of northern Africa. Their influence extended to a period as late as the 7th century. Ancient authors have left us strange anecdotes of their customs, manners and savage appearance. The Ababdeh, the Bisharin and other tribes are supposed to have descended from the Blemmyes.

BLENDE (German, «to blind,» in allusion to the fact that the mineral is easily mistaken for galena, and yet yields no lead). A native sulphide of zinc, having the formula ZnS, and known also as sphalerite. It crystallizes in tetrahedral forms belonging to the isometric system, and has a very perfect cleavage. It is commonly brown, black or yellow, but may have other colors also, and may be nearly colorless when pure. Its hardness is from 3.5 to 4, and its specific gravity is about 4.00. It usually occurs massive, with dodecahedral cleavage, and is found commonly in connection with galena, and also in deposits of considerable extent in cavities in limestone. It is a valuable ore of zinc, and is mined in Cornwall (England), in Saxony, in the Hartz Mountains, and in various parts of the United States, notably in Illinois, Missouri (near Joplin), Wisconsin, Iowa and Colorado. The miners of Cornwall call it «mock lead» and «black-jack.»

BLENHEIM, blĕn'ĭm, or **BLINDHEIM**, Bavaria, village about 23 miles from Augsburg, the theatre of a great battle, fought 13 Aug. 1704 (also called the battle of Höchstädt, from another village of this name in the vicinity), in which Marlborough and Prince Eugene, commanding the allied forces of England and the German empire, gained a brilliant victory over the French and Bavarians. The latter armies were drawn into the engagement under the most unfavorable circumstances. Both these armies amounted to 56,000 men, while the forces of Marlborough and Eugene were about 52,000. The first had thrown their troops chiefly into the two villages of Blenheim and Kinzingen, which they considered as points of support for their wings, though at too great a distance in front of their main position. A large proportion of cavalry was in the centre, since each army, the Bavarian as well as the French, had their horse on their wings, and in this way those of two wings must necessarily join each other. Both the commanders would undoubtedly have perceived and corrected this mistake, as Tallard, the French general, had in Blenheim alone 27 battalions of infantry; but they expected so little to be attacked, that when the line of the allies began to move, 13 August, at 2 o'clock in the morning, they supposed them to be marching off. The greatest part of their cavalry was sent to forage. Even at 7 o'clock, when the heads of the eight columns with which Eugene and Marlborough advanced toward the Nebelbach were to be seen, Tallard thought the whole a stratagem intended to cover the retreat; but he soon saw his error. The dispersed troops were recalled in the greatest hurry, and the cannons were drawn up in line. The French and Bavarians made every exertion to prevent the passage of the enemy over the small stream of Nebelbach, and the capture of the two villages, the conquest of which was considered by Marlborough and Eugene as decisive. Their line of attack was uncommonly long, about four and a half miles. Marlborough, in order to secure his right wing, attacked Blenheim, but without success; he then changed his plan, and threw himself with his principal forces into the wide interval between the right wing and the centre of the enemy, leaving only as many troops before Blenheim as were necessary to check the body which occupied this position. At 5 o'clock in the afternoon he succeeded, after great efforts, in passing the Nebelbach, by which his victory was decided. Tallard himself was among the prisoners; his son was killed. Of 56,000 French and Bavarians, 14,000 were taken prisoners and 25,000 perished. The victors lost about 5,000 killed and 8,000 wounded. The consequences of the battle were decisive. Bavaria, as Marlborough had anticipated, fell into the power of Austria. Near Blenheim was fought another battle in which the French defeated the Austrians 19 June 1800.

BLENHEIM HOUSE, the name of the seat of the Duke of Marlborough, in the parish of Woodstock and county of Oxford. The estate having been given by Queen Anne to Marlborough for his eminent services, Parliament granted the sum of half a million sterling to erect a suitable family seat. The building was entrusted to Sir John Vanbrugh, and called Blenheim, from the village where the Duke gained his great victory. In this park once stood the royal palace of Woodstock, where Alfred is said to have resided, and which was the favorite residence of Henry II, who erected a house in the park for his favorite mistress, Rosamond Clifford, whence the well-known legend of Woodstock-bower, Queen Eleanor, and the Fair Rosamond. Edward III was also much attached to this palace, in which his eldest son, the illustrious Black Prince, was born, as well as his youngest son, Thomas, Duke of Gloucester, usually called Thomas of Woodstock, from that event. Richard II likewise kept his court here, at which time the poet Chaucer resided at Woodstock, in a house which stood near the present entrance to the park. During the civil wars of the 17th century it was for some time defended for the King; but it ultimately surrendered, and was much injured and dilapidated by the parliamentarians. The usual approach to Blenheim from Woodstock is through a triumphal arch or portal. In front of the building stands a sculptured column 130 feet high, surmounted by a statue of the Duke, whose victories and achievements are recorded on tablets round the base. The front of the house measures 348 feet from wing to wing, and although architectural critics find many faults in detail, the general effect is in the highest degree noble and commanding. The interior is extremely magnificent; the hall, supported by Corinthian pillars, is 67 feet high; and the ceiling was painted by Sir James Thornhill, the design representing Victory crowning the Duke. The gallery and bow-window room abound in portraits by the most eminent masters, both foreign and English. On the tapestry of the latter are figured the various battles gained by the same great general, and more especially that of Blenheim. The saloon, a noble and spacious apartment, communicates with the hall, and occupies the entire breadth of the centre. The lower part is lined with marble, and six of its compartments are decorated with pictures by La Guerre, representing the inhabitants of the different nations of the world in appropriate costume. On the ceiling is a representation by the same artist, of the victorious Duke arrested in his career by Peace and Time. The remaining principal subjects of admiration are the library, theatre, State drawing-room, blue and green drawing-room, grand cabinet, the dining-room, etc. In the chapel, which forms one of the wings, is a fine marble monument by Rysbrack, to the great Duke and his almost equally celebrated Duchess, Sarah. The gardens and grounds, which are exceedingly spacious, were laid out by Brown, who contrived to make a most admirable use of the small river Glyme in the formation of a lake, or piece of water, which is justly deemed one of the greatest beauties of the place. It is crossed by several arches, and at the middle or grand approach is a magnificent bridge, the span of the centre arch of which is 101 feet. Consult Taunt, 'Blenheim and Woodstock' (Oxford 1909).

BLENK, James Hubert, American Roman Catholic archbishop: b. Neustadt, Bavaria, 28 July 1856; d. New Orleans, 20 April 1917. He received his early education at Saint James College, Baltimore, and at Jefferson College, Convent, La. Admitted to the Society of Mary in 1874, he studied in the Irish and French Marist seminaries and at the Catholic University of Dublin; was ordained priest in 1885; became professor at Jefferson College, and president 1890–96; and in 1897–98 was rector of a church in Algiers, La. He served as auditor and secretary to the Apostolic Delegation to Cuba and Porto Rico in 1899 and was appointed bishop of Porto Rico. In 1906 he was consecrated archbishop of New Orleans. He was one of the organizers of the Catholic Winter School of America and chairman of its board of studies. He raised $30,000 for the relief of the hurricane victims in Porto Rico 1899, and was commissioned by President McKinley to distribute the funds and report the needs of the people to the United States government. He erected several churches and schools in New Orleans, many for the colored race. He founded Saint Joseph's Seminary and received into his archdiocese many exiled French religious. He was a forceful speaker in English, French, German and Spanish and an active promoter of Catholic educational and charitable societies. He contributed to various newspapers on religious, social and economic topics and to the 'Catholic Encyclopedia.'

BLENKER, Louis, German-American soldier: b. Worms, Germany, 1812; d. 16 Oct. 1863. He took an active part in the revolutionary movement of 1848 in Germany and was forced to leave his native land, emigrating to the United States. He organized the 8th regiment of New York Volunteers at the outbreak of the Civil War, and was its colonel. He was promoted to the rank of brigadier-general at the first battle of Bull Run, and in 1862 commanded a division in western Virginia and was engaged in the battle of Cedar Keys. Soon after he was superseded by General Sigel. He was mustered out of the service 31 March 1863 and died in October of wounds received while at Warrenton, Va.

BLENNERHASSETT, Harman, English emigrant in America: b. Hampshire, England, 8 Oct. 1764; d. on the island of Guernsey, 2 Feb. 1831. He sprang from a wealthy and highly connected house which traced its ancestry back to Edward III; was educated at Westminster School, London, and Trinity College, Dublin, graduating 1790. The youngest of three sons, he studied for the law, but the death of his brothers soon after made him head of the family. Early in 1796 he privately married his sister's daughter, Margaret Agnew, a beautiful and highly accomplished girl of 18, also of excellent family, her father having been lieutenant-governor of the Isle of Man, and her grandfather an English officer killed at Germantown. This incestuous union brought its ultimate punishment from nature in a family of physical and moral wrecks; but a more immediate one was entire social ostracism, which soon drove him to break his entail and sell his estates, except some reserved incomes, and come to America with his wife, bringing with him at the same time his library and philosophical apparatus. Arriving 1 Aug. 1796, he settled, in 1798, on a small island in the Ohio River a few miles below Parkersburg, W. Va., and spent $60,000 on a house and grounds, pictures and statuary. This was for years the show place of America west of the Alleghanies, and drew a stream of notable guests, whom he entertained with lavish hospitality. Here he read, cultivated music, which was his chief passion, and dabbled in feeble absent-minded scientific experiments. In 1805 Aaron Burr (q.v.) was one of his guests, who then or next year induced him to join in the scheme for a southwestern empire, to include Mexico, in which fantastic state Blennerhassett was to be prime minister and a duke, and perhaps ambassador to England. He was a timid, dreaming, futile, unadventurous man, but like many such may have fancied himself a great statesman and hero *in posse*. He may have consented to Burr's proposal because Mexico was farther from Great Britain than the Ohio, and the canker of his life was fear lest chance should disclose his secret to his friends and children. His wife, much the stronger nature of the two, was certainly ambitious for him, and he would not have embarked in such a venture without her approval. Anyway, he advocated Burr's «colonization» plan in the papers, and invested a great sum in arms, ammunition, provisions, boats, etc., on the faith of obligations from Burr's son-in-law Allston, which were largely defaulted. The scheme fell through; Blennerhassett was twice arrested, imprisoned and tried for treason, but discharged in 1807 on the acquittal of Burr. His place, however, had been wantonly injured by the militia, and was seized by his creditors and turned into a hemp field. The mansion was converted into a granary and was finally burned by accident. Blennerhassett now settled in Natchez, and soon after bought a 1,000-acre cotton plantation on the Mississippi, a few miles above Port Gibson, which he called La Cache. It was unsuccessful, and the War of 1812 injured his commercial speculations; and in 1819 he sold it for $28,000 and removed to Montreal, practising law in hope of obtaining a judgeship through his old schoolmate, the Duke of Richmond. This failing, he returned to England in 1822 in hope of winning back his property by a reversionary action, and then of obtaining employment through an influence which no longer existed. In 1824 he came back after his family. Everything failed him, though he and his wife were decently treated; at last his health gave way, and he died at Port Saint Pierre on the island of Guernsey. He was generous with his money while he had it, and helped out of financial difficulties several of the musicians he consorted with. His wife, though disinherited, had always had an income paid her bv her sisters; and in 1838 she received a property by the will of her husband's maiden aunt. In 1840 she came to the United States to push a claim before Congress for the island property, and indemnity for the ravages of the militia. Henry Clay favored it, and its passage was probable; but before it came up she died in New York, 16 June 1842. The story of her being left penniless with a dependent family (the youngest was 19 at his father's death), and of her dying in poverty and being buried by sisters of charity, are fictions. She had some literary ambitions, and while in Montreal wrote two volumes of verse, 'The Deserted Isle' (1822), and 'The Widow of the Rock, and Other Poems' (1824). Consult Therése Blennerhassett-Adams, 'The True Story of Harman Blennerhassett,' in the *Century* (Vol. 62, 1901); 'The Blennerhassett Papers' (1864); Safford, 'Life of Blennerhassett' (1835); Pidgin, 'Blennerhassett,' a romance (1902).

BLENNY. These small fishes of the spiny-rayed marine family *Blenniдæ,* frequent rocky coasts and shallows, in seas of all parts of the world. Their elongated bodies, some of which are scaleless, are remarkable for the abundance of slimy matter with which they are covered. These fishes are extraordinary in possessing but one dorsal fin, which in some species is deeply divided; and in having the faculty of using their ventral fins to aid them in moving about among the rocks and sea-weed. They are frequently deprived of water, by the ebb of the tide, when they are capable of subsisting for some hours. Small crustaceans form their main food. In some species the eggs are retained in the oviduct until they hatch, so that the young are produced alive and capable of seeking their own food. They are not edible but owing to their tenacity of life and activity are generally sought for the aquarium. Because of their ability to move about out of the water they are often known as lizard skippers.

BLENORRHŒA, an old term signifying a muco-purulent discharge from any mucous membrane. This discharge is usually creamy white and consists usually of water, mucus, epithelial cells, white blood cells, or pus cells, and bacteria. At the present time a blenorrhagic discharge is definitely named according to the structure involved. Thus a blenorrhœa of the eyes is termed a purulent conjunctivitis; of the vagina, leucorrhœa; of the urethra, gleet or urethritis; if a urethritis of infectious origin, gonorrhœa, etc. Treatment is usually local and general. Tonic stimulating applications may be locally applied, and occasionally caustic stimulants, as nitrate of silver, and the general health built up as thoroughly as possible.

BLEPHARITIS, an inflammation of the margin of the eye-lids and hair follicles. It may consist of a very slight hyperæmia or redness that causes itching and discomfort. This form may be due almost entirely to eye-strain and proper glasses will usually cure it. The disease may be more extensive, involving the margin and the follicles, with redness and swelling and whitish scales. The eyelashes may drop out, but usually are regrown, and there is much itching and discomfort. This form may also result from refractive errors, or may be the index of a bad constitutional state from poor food, bad surroundings, or it may follow the infectious diseases, notably measles. A more persistent form is associated with ulceration and loss of the eyelashes. This is usually a very chronic type and resistant to treatment. In the management of all forms, all errors of refraction should be corrected by properly adjusted glasses,— not on opticians' prescriptions,— and the local treatment by stimulating ointments.

BLEPHAROPLAST. The blepharoplast is the organ which gives rise to the cilia of sperms. While it cannot be said that all cilia are developed from blepharoplasts, it is equally true that blepharoplasts do not occur except in connection with cilia. Usually, blepharoplasts are very small, $\frac{1}{25000}$ of an inch, or even less, in diameter; but in Ginkgo, the Maiden Hair Tree, they are much larger, and in the cycads they reach a diameter of $\frac{1}{1000}$ of an inch. The appearance and behavior of the blepharoplast during the formation of sperms is well illustrated by the common liverwort, Marchantia (Fig. 1). Toward the end of the spermatogenesis, in the cell which is to produce two sperms, two blepharoplasts appear (Fig. 1, *A*). The two blepharoplasts give rise to the spindle fibers as the nucleus divides (*B*). After the nuclear division, the protoplasm divides obliquely and in each new cell the blepharoplast moves to one of the pointed ends (*C*). These two cells are the very young sperms. From the blepharoplast of each of the young sperms, two cilia grow out (*D*). The protoplasmic and nuclear portions of the sperm now elongate and become indistinguishable while the blepharoplast itself also becomes somewhat elongated and very slender. At maturity the two cilia become much longer than the body of the sperm (*E*; *s*, body of sperm; *c*, cilia).

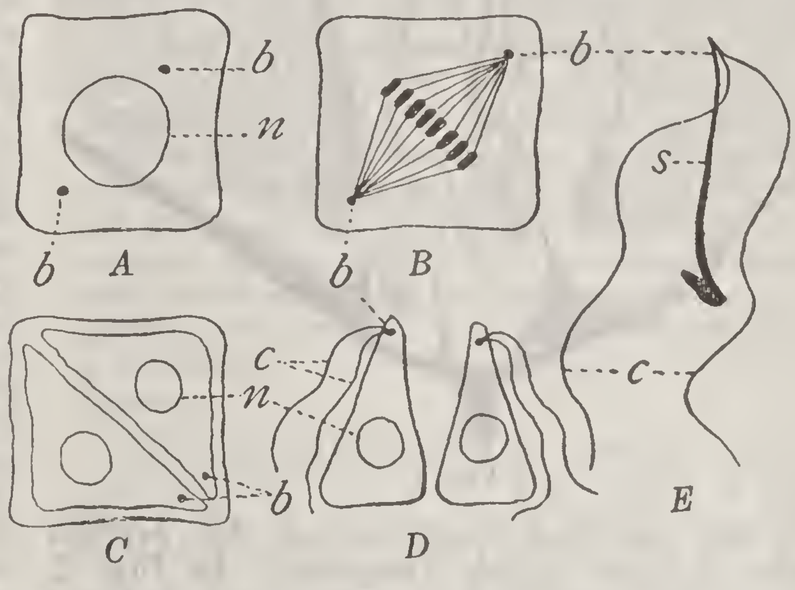

FIG. 1.

Fig. 1.—*A*, one of the cells which is to produce two sperms: *n*, nucleus; *b*, blepharoplast. *B*, division of the cell shown in *A*. *C*, the two cells resulting from the division: these cells are very young sperms. *D*, the two sperms, a little older, each showing two cilia; (*c*), growing out from the blepharoplast. *E*, a mature sperm.

In the ferns, the development of the sperm and the early development of the blepharoplast are similar, but in later stages the blepharoplast becomes more elongated and gives rise to a large number of cilia. In the scouring rush, *Equisetum,* the development of the blepharoplast is more complex. The early stages are about the same as in the liverwort and the fern, but after the blepharoplast has begun to elongate, it breaks up into a large number of granules from which the numerous cilia develop. The granules soon fuse again and form a solid band. The largest sperm in either the plant or animal kingdom is found in the cycads, the most familiar representative of which is the Sago Palm (*Cycas revoluta*), whose rigid, dark green leaves are in such demand on Palm Sunday and on funeral occasions. The cycad sperm reaches a diameter of $\frac{1}{125}$ of an inch and, consequently, is visible to the naked eye. The blepharoplast, which in the spherical condition may reach a diameter of $\frac{1}{1000}$ of an inch, breaks up into an immense number of granules; the granules then fuse and form a spiral band from which thousands of cilia arise. Figs. 2 and 3 represent the principal features of the process in the African cycad, *Stangeria*. In Fig. 2, three of the pollen tubes show a rounded cell with two blepharoplasts surrounded by radiations. In the lower right hand tube, the rounded cell has divided, forming the two young sperms. In Fig. 3, the blepharoplast has developed into a spiral band bearing innumerable cilia. The sperms, at this stage, are actively swimming and are just about to enter the eggs.

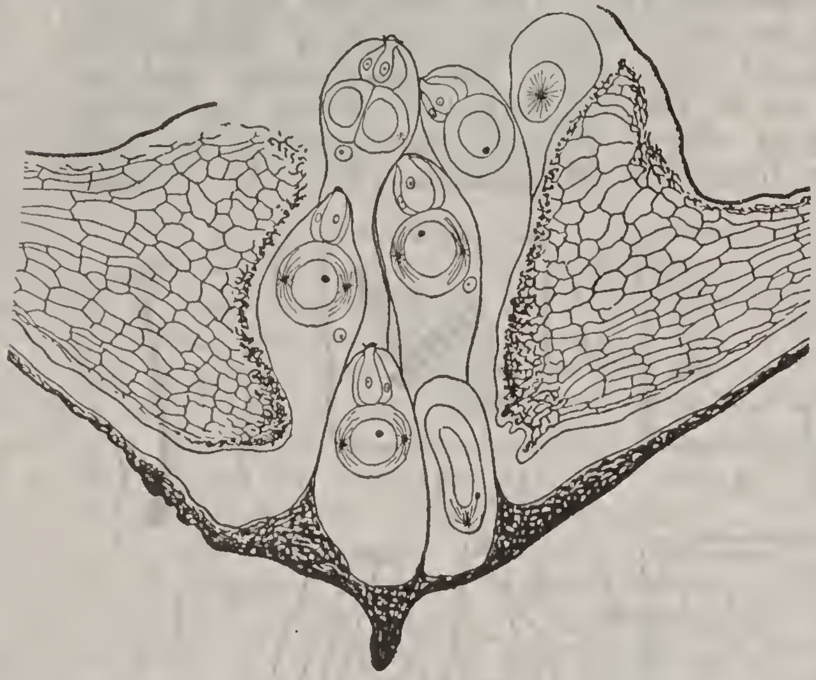

FIG. 2.

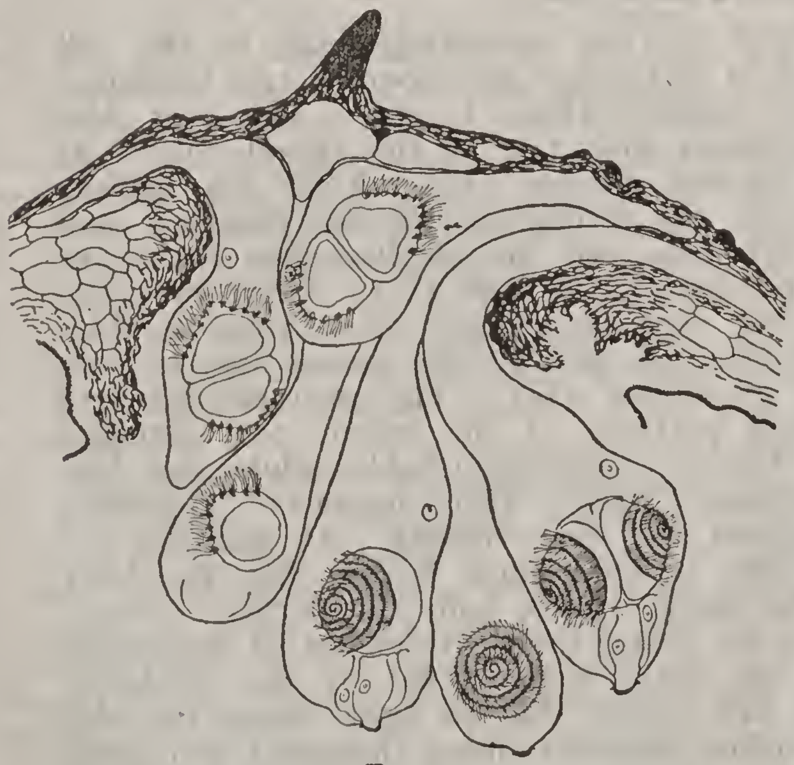

FIG. 3.

With the exception of the red algæ, all plants below this level have swimming sperms; but in all the Gymnosperms, except the cycads and Ginkgo, and in all the Angiosperms, the swimming habit has been lost. It is worthy of note that the swimming habit reaches its highest and most complex development just as it disappears.

It has long been debated whether the blepharoplast is a centrosome or not. In our opinion, the blepharoplast is a centrosome which, in its later stages, has assumed peculiar functions.

Blbliography.— Chamberlain, C. J., ‘The Homology of the Blepharoplast’ (*Botanical Gazette,* Vol. XXVI, 1898, p. 431); Ikeno, S., ‘Blepharoplasten in Pflanzenreich’ (*Biologisches Centralblatt,* Vol. XXIV, 1904, p. 211); Sharp, L. W., ‘Spermatogenesis in Equisetum’ (*Botanical Gazette,* Vol. LIV, 1912, p. 89).

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BLÉRÉ, blā-rā, France, town in the department of Indre-et-Loire, on the Cher, 15 miles east-southeast of Tours. It contains a notably fine 16th century chapel. In the vicinity is the Château Chénonceaux, built in the time of Francis I, and still in excellent preservation. It was given by Henry II to his mistress, Diana de Poitiers, who was dispossessed by Catherine de Medici on the death of Henry. In the latter part of the 18th century it was frequented by Fontenelle, Voltaire, Rousseau and all the wits of the time, who were drawn together by the then owner of the château, Madame Dupin, widow of a *fermier-général* who died in 1799. Consult Cook, ‘Old Touraine.’ Pop. (1911) 3,533.

BLES, blĕs, **Henri**, Flemish painter: b. probably at Bonvignes near Dinant, about 1480; d. about 1550. Very little is known of his career. Even his name has been a subject of controversy. His only signed picture, ‘Adoration of the Magi’ is in the Munich Museum. By the Italians he was called Civetta because of the peculiar monogram usually affixed to his pictures. He is supposed to have resided in Flanders, perhaps at Antwerp, and also probably made a tour of Italy. Many works have been attributed to him but the one signed work mentioned above is insufficient from which to judge of his style. Bles has the glory of having elevated landscape painting into a distinct genre. Consult Bequet, A., ‘Henri Bles’ (1865); Helbig, Jules, ‘Histoire de la punture and pays de Liège’ (Liège 1873).

BLESBOK, blĕs′bŏk, one of the African hartebeests (*Alcephalus albifrons*), now rare, which was distinguished by the violet color of its coat. See HARTEBEEST.

BLESSING, or **BENEDICTION.** The expression of wishing one well soon gave rise, in early ages, to a solemn act, accompanied by symbolic signs; this was the blessing or benediction which is coeval with the earliest expression of religious feeling. In patriarchal times, as among primitive races, when the authority of the head of a family included that of the priest and the civil ruler, the blessing of course appertained chiefly to him, on account of his venerable character, and when the priests began to form a separate class, became, in certain cases, a prerogative of theirs. As the authority of the father, in the infancy of every nation, is extremely great, the idea soon sprang up that his prayers, invoking the favor of the Deity, were more effectual than those of others, and that whatever he blessed would be likely to receive the favor of God. The same importance was soon attributed to blessings conferred by a priest. The heathen, the Jews, and many Christian sects, have cherished this belief. By the Jewish institutions, certain benedictions were reserved to the priest and among the Hebrews the blessing of food came in later times to be a giving of thanks. In the Roman Catholic Church different benedictions are appropriated to different degrees of the clergy. The bishops alone can confer those benedictions which are connected with unction, and are called consecrations, as, for instance, the consecration of kings and queens, of the cup and *patera,* the church and altar. To them also is confined the benediction of abbots and abbesses, of knights and the holy oil. For the benediction of the holy vestments, etc., they may employ a substitute. Every Roman Catholic clergyman may confer the benediction on the occasion of betrothment; also the marriage benediction; may bless the fruits of the earth, and the holy water. The benediction of a bishop is eagerly sought for by a faithful Roman Catholic, as contributing peculiarly to his spiritual welfare; and the Catholic clergy, in general, use the benediction as a salutation or reward for a service, etc. The Roman Catholic Church blesses things animate and inanimate, the benedictions being generally accompanied with the sprinkling of holy water, and the use of incense, and universally with the sign of the cross. There are 12 benedictions proper in the Anglican Prayer Book, two of these being of things, the blessing of the bread and wine in the prayer of consecration at communion, and the water in the baptismal offices. Among most Protestant bodies a blessing is pronounced at the conclusion of all religious services.

BLESSINGTON, Marguerite (COUNTESS OF): b. Knockbrit, near Clonmel, Ireland, 1 Sept. 1789; d. Paris, 4 June 1849. She was the daughter of Edmund Power, and at the age of 15 was married (unhappily) to a Captain Farmer, who died in 1817. A few months after his death she married Charles John Gardiner, afterward first Earl of Blessington. In 1822 they went abroad together, and continued to reside on the Continent till the Earl's death in Paris, in 1829, when Lady Blessington returned to London and took up her abode in Gore House, Kensington, which had been bequeathed to her by her husband. Here for many years she held those celebrated reunions and soirées, at which the most distinguished literary characters in London were wont to assemble. The fascination of her manners and conversation, with her genial warm-heartedness of character, rendered these gatherings most attractive; but certain equivocal circumstances in relation to her connection with Count d'Orsay kept her in a manner ostracized by female society of the straiter sort. The Count had married a daughter of Lord Blessington by his first wife, and been separated from her shortly afterward, but after the death of his father-in-law, resided with the Countess during the remainder of her life. Lady Blessington had made her début as an authoress in 1822 by the publication of two volumes of ‘Sketches.’ In 1832 she contributed to the *New Monthly Magazine* ‘Conversations with Lord Byron,’ considered by many as the best of her productions. She also wrote numerous novels, including, among others, ‘The Belle of a Season’; ‘The Two Friends’; ‘Strathern’; and ‘The Victims of Society.’ None of these have much literary merit, but describe scenes in fashionable life with considerable power, and they enjoyed at the time a large share of popularity. She acted as editress for several years of ‘Heath's Book of Beauty’ and the ‘Keepsake,’ and also of another annual, the ‘Gems of Beauty.’ In 1849 she proceeded to Paris, whither Count d'Orsay had previously gone in the hope of obtaining an appointment under Louis Napoleon, with whom they had been intimate during his exile in England. Consult Madden, ‘Life of the Countess of Blessington’ (1855).

BLICHER, Steen Steensen, stān stān′sĕn blĭн′ė*r*, Danish poet and novelist: b. Vium, Jutland, 11 Oct. 1782; d. Spentrup, 26 March 1848. His first work was a translation of ‘Ossian’ (2 vols., 1807–09), and his first original poems appeared in 1814, but attracted little notice. He quickly won a national reputation with his novels, and in 1842 appeared his masterpiece of novel writing, ‘The Knitting Room,’ a collection of short stories in the Jutland dialect.

BLICKENSDERFER, George C., American inventor: b. Erie, Pa., 1850; d. Sound Beach, Conn., 15 Aug 1917. He began life as a drygoods salesman, equipped only with a public school education. In 1892 he brought out the typewriting machine known by his name, the essential principle of which was a type wheel which was rotated in order to bring the desired letters or characters in position to make an impression on the paper. Being much simpler and cheaper than the machines then in use it achieved an immense popularity. Later the inventor brought out an electric typewriter, which was extremely easy of manipulation. Mr. Blickensderfer adapted the typewriter he invented to the Chinese langauge, an accomplishment which so interested the Japanese government that it revised its written language to adapt it to a typewriter keyboard. After the outbreak of the Great War in 1914 Mr. Blickensderfer devoted his attention to inventions of belt loading devices by which cartridges are automatically loaded into machine guns, and to a machine gun mount which facilitates the use of these engines of war. At the time of his death Mr. Blickensderfer was president of the Blickensderfer Typewriter Company.

BLIDA, blẹ-dä′, a fortified town of Algeria, 30 miles southwest of Algiers, with which it has rail connection. It is well built, with modern houses and public edifices, the centre of a flourishing district, and having a good trade. There are cedar and cork trees in the neighborhood and mines of copper and lead. The principal exports are oranges, grain, tobacco, raisins, etc. Pop. (1911) 35,461.

BLIGH, William, English navigator: b. Plymouth, England, 9 Sept. 1754; d. 7 Dec. 1817. He acquired considerable celebrity from having been the commander of the ship *Bounty* when the crew mutinied in the South

Seas and carried her off. She had been fitted out for the purpose of procuring plants of the bread-fruit trees and introducing these into the West Indies. Bligh, who had sailed with Captain Cook on his second voyage round the world, and served with Lord Howe before Gibraltar in 1783, obtained the command, and in December 1787, left Spithead for Otaheite, where he arrived, and remained till April 1789. Having loaded his vessel with plants he set sail and was proceeding on his voyage for Jamaica when he was seized in bed, bound and brought on deck. The launch was lowered, and Bligh, with 18 men supposed to be well disposed to him, were forced into it, with no other provision than 150 pounds of bread, 32 pounds of pork, a little rum and wine, and 28 gallons of water. Thus scantily provided they found themselves in the open sea, not far from the island of Tofoa, in lat. 19° S. and long. 184° E., and managed by admirable skill and perseverance, though not without enduring fearful hardships, to reach the island of Timor in 41 days, after running 3,618 miles without the loss of a single man. Ultimately 12 of the number reached England. Bligh in a second voyage accomplished the object of the first by giving the bread-fruit tree to the West India Islands. When several of the mutineers were afterward tried at Portsmouth, sufficient evidence was obtained to show that Bligh himself was not free from blame, and had on many occasions been too much inclined to play the tyrant. This feature in his character was afterward manifested on a larger scale. In 1805 he was appointed governor of New South Wales, and acted so harshly that the other authorities interfered and·put him in confinement. After his return he became a rear-admiral. See PITCAIRN ISLAND.

BLIGHIA, blī'ĭ-ạ, a genus of trees and shrubs of the family *Sapindaceæ,* the principal species of which is *B. sapida* (*Cupania sapida* of some botanists), the akee tree indigenous to west tropical Africa and naturalized in the West Indies since the close of the 17th century. It is also planted in southern Florida. The tree attains a height of 30 feet, bears pinnate ash-like leaves and very fragrant whitish flowers, from which by crude distillation the colored people obtain a cosmetic and which would probably yield a valuable perfume under proper management. The rich, red fruits, as large as goose eggs, are used for dessert and largely also in cookery.

BLIGHT, an indefinite term applied to any diseased state of cultivated plants, but gradually being restricted to plant diseases caused either by bacteria or fungi. Among the plants subject to blight are the apple, pear, potato, bean, strawberry, eggplant, currant, grape and raspberry. See sections on diseases in articles on various plants; also PLANTS, DISEASES OF.

BLIGHT, American, an English and Australian name for the wooly apple louse or «apple blight,» one of the aphides. See APHIS.

BLIGHT-BIRD, a small insectivorous bird (*Zosterops cœrulescens*) of New Zealand, which devours the «blight» or plant-lice on fruit trees. It is one of the white-eyes (q.v.).

BLIGHTY, a name generally used in Brittish India as a general designation for Europe. During the War in Europe in 1914–18 the word was introduced on the western front by the Anglo-Indian troops and soon came into general use as a nickname for England.

BLIND, blĭnt, **Karl,** German political agitator and writer on history, mythology and Germanic literature: b. Mannheim, 4 Sept. 1826; d. London, England, 31 May 1907. He was educated at Heidelberg and Bonn, and from his student days till he settled in England in 1852 he was continually engaged in agitating or in heading risings in the cause of German freedom and union, and was frequently imprisoned. The democratic propaganda was afterward supported by his pen; and he wrote political and biographical works: ‹Fire-burial Among Our Germanic Forefathers›; ‹Teutonic Cremation›; ‹Yggdrasil, or The Teutonic Tree of Existence›; biographies of Freiligrath, Ledru Rollin and Francis Deák.

BLIND, Mathilde, German-English poet: b. Mannheim, 21 March 1841; d. London, 26 Nov. 1896. She went to England in 1849, and won fame by her writings: ‹The Prophecy of Saint Oran› (1881); ‹Life of George Eliot› (1883); ‹Madame Roland› (1886); ‹The Heather on Fire,› a tale (1886); ‹Ascent of Man› (1888); ‹Dramas in Miniature› (1891); ‹Songs and Sonnets› (1893); and ‹Birds of Passage› (1895). Consult ‹Poetical Works of Mathilde Blind,› with memoir (London 1900).

BLIND. See BLINDNESS.

BLIND, Education of the. When it is stated that prior to 1830 the blind of America were to be found «moping in hidden corners or degraded by the wayside, or vegetating in almshouses,» it is the adult blind that is meant. Still blind children were occasionally found in these places, though it could scarcely be said that they were vegetating, as could be said of the untrained deaf children.

The British census of 1851 first showed the world that over 80 per cent of the blind are adults. American schools for the blind were started, *first,* because of the widespread interest in the results of educating the young deaf and dumb, which furnished inspiration for new fields of educational endeavor; *secondly,* because the country was coming to the conviction that all the children of the state should receive education both as a matter of public policy and as a private right; and *thirdly,* because reports of what had been accomplished abroad in schools for the blind were being promulgated in our land. By 1830 the more progressive States of the east were ready to give their blind children school training. In that year the government first included in the national census the deaf and dumb and the blind. The work of the blind was to begin with scientific foreknowledge as to their number. In 1829 certain gentlemen in Boston obtained the incorporation of the «New England Asylum for the Blind.» By a most fortunate circumstance, the interest and services were obtained of a graduate of Brown University, Dr. Samuel G. Howe, who, after finishing his medical studies, had chivalrously gone to the aid of the Greeks. Dr. Howe went at once to Europe to study methods of instruction. Upon his return, in 1832, the school was opened with six pupils. In New York the act of incorporation of the New York Institution for the Blind was passed in 1831; but funds were needed and no one went abroad to study methods. This school opened in March 1832, antedating by a few months the school at Boston. In the very same year a German teacher of the blind, a Mr. Friedlander, most opportunely came to Philadelphia, in the hope of starting a school for the blind there. Having trained certain blind children he exhibited their accomplishments, *first,* to a few influential people, *secondly,* before a large audience among whom he distributed a leaflet, «Observations on the instruction of blind persons.» A meeting of public-spirited citizens followed, funds were liberally contributed, fairs held and the success of the cause was assured. The Pennsylvania institution for the instruction of the blind was opened in 1833, fully 10 months before an act of incorporation was obtained. The three schools at Boston, New York and Philadelphia are called the pioneer schools. All sprang from private effort and private funds. All were incorporated as private institutions, and remain so to this day. Three similar institutions for the blind have arisen in this country, at Baltimore, at Pittsburgh and at Hartford. As recently as 1912 an institution for the deaf with a department for the blind was opened with private funds supplemented by an appropriation from the legislature, in Brattleboro, Vt. This department was discontinued in 1917.

Schools.— The origin of the State schools differs from that of the type above given only in that classes of trained pupils from the earlier schools were exhibited before the State legislatures as well as before the people. State appropriations followed and the institutions were inaugurated as State institutions. The new schools sprang into being with astonishing rapidity. There were, in 1917, 44 residential schools for the blind in the United States. (For an account of the day schools of 13 cities, opened between 1900 and 1917 see below). Every State in the Union makes provision for its blind of school age either in its own school or in that of a neighboring State. In our sparsely-settled country, especially west of the Alleghanies and south of Maryland, great efforts had to be made to find the children and still greater efforts to persuade the parents to send them to school. In certain States where the amount of the public fund seemed to preclude a special grant for the blind, pupils of this class were brought together in connection with a school for the deaf and dumb, forming «dual schools,» as they are called. These institutions could not help being unfair to their blind contingent; for in nearly every such case the blind came to a school already established as a school for the deaf, and under the superintendence of a man especially interested in the education of the deaf; moreover, the number of the deaf pupils usually far exceeded that of the blind. There are still a few of these dual schools, but wherever possible they have been divided into two distinct institutions. In Northern schools the colored blind are educated with the white; in Southern schools it is best for the colored to have schools of their own. Both the whites and they prefer this arrangement. The first school for the colored blind was opened in North Carolina in 1869.

All the institutions for the blind were in their very first inception schools. The pioneer schools imported literary teachers from Paris and handicraft teachers from Edinburgh. At first only the brighter class of pupils came under instruction. Teaching them was easy. They progressed with amazing strides; all was enthusiasm; exhibitions were called for and widely given (Dr. Howe's pupils gave exhibitions in 17 States); large editions of the various annual reports were exhausted. Soon, however, less bright pupils came to be admitted; then the curriculum of studies began to sober down to the practical and comprehensive one prevailing to-day. Whatever occupation the boy or girl expects to follow after leaving school, it is assumed he will follow it better and thus live more happily and worthily if he has a general education. When, as was formerly the case, the period or term of schooling allowed pupils was shorter than it is now, they were not admitted before the age of eight or nine. Now that kindergarten departments have been universally added to the schools, the pupils are urged to enter at an early age; because experience has shown that at home these little blind folks are coddled rather than trained, so much so in fact that by the time many of them come to school their natural growth of body and mind has been so interfered with by inaction, that all the efforts of the schools cannot make up for lost time and opportunity. The principle of periodicity of growth has now come to be understood and the importance of applying the proper stimulus at the period most sensitive to it comprehended. Children with good sight and hearing have got along without kindergarten training, and so have blind children, but of all the useful means of reaching and developing the average blind child none is so effective as the properly-conducted kindergarten. The practical knowledge of things comes to the blind through the hand, their fingers being veritable projections of their brains. Thus must their hands not only be trained to sensitiveness of touch but to be strong and supple, so that they may, indeed, be dexterous; for as their hands are so are their brains. The kindergarten cultivates ear and heart and hand and brain as nothing else does. Even color is not wholly omitted in kindergartens for the blind. Many of the children see colors, and those who do not love to talk about them and certainly derive some indirect value from considering them. Wise, resourceful kindergartners who have either bought or made some Montesorri didactic material have not failed to utilize it with their newcomers or with their backward children. Of late years where institutions have either enlarged on the original site or rebuilt on a new, the kindergarten department has been housed by itself as an independent unit, all living as a family and with classes under the same roof. This is a great advance.

Blind children with kindergarten training are more susceptible to instruction than those without it. Above this department the course of academic studies in American schools requires from seven to eight years, which means a primary, a grammar and a high school education; or instruction in object lessons, reading, writing, spelling, grammar, composition, arithmetic, history, physiology, botany, zoology, geology, physics, algebra, geometry, civics, English literature, typewriting, bookkeeping and simple business, and sometimes Latin and modern languages. Not a few pupils have fitted for college where they took the regular course with the seeing students, and from where they were graduated usually with distinction. Formerly much of the teaching was oral, which, in many cases, was apt to be more pleasant than profitable to the pupil. Since the general introduction of the embossed textbook and tangible writing, the pupil has been forced to depend more and more upon himself, obviously with better results. In fact, the work has been growing more and more practical, emphasis being put upon the vocational. The methods of teaching the blind correspond in general to those of teaching other hearing children. The common appliances have but to be raised and enlarged as in maps and diagrams, or simply made tangible, which may be done, for example, by notching an ordinary ruler so that the graduations can be felt.

Industrial Training.— Industrial training has been an integral part of the school course from the beginning. Recently educational manual training has been generally introduced as preliminary to the trades. Sloyd has been found especially adapted to the blind. The handicrafts — chair-caning, hammock-making, broom-making, carpet-weaving, and a few others, alone remain of all the many trades taught at one time or another in our schools. Manual occupations of some kind will always be taught, even were it evident that none of them would be followed by the blind as trades; for it is by doing and making that the blind especially learn best. Then, it is essential that they be kept occupied. A few institutions built on the cottage family plan require pupil participation in the daily housework, a policy which if wisely conducted is of not less developmental value than the school occupations, since it tends to build up social efficiency. A youth who is efficient in a community of youth is the more likely to be so in the community of adults. In the past, before the introduction of such varieties of labor-saving machinery as the last half century has seen, many of the discharged pupils followed some manual trade and succeeded in subsisting by it. To-day this is less and less possible. The mind itself of the blind is least trammeled by the lack of sight; hence some pursuit where intelligence is the chief factor would seem to be best adapted to his condition. Music, of course, opens up his most delightful field. It is said that all the force of the superintendents of the early schools was required to prevent the institutions from becoming mere conservatories of music. To-day only those pupils pursue music in regular course who have talent for it; but even those are not allowed to neglect other studies for it. It is the experience of the American schools, as of the British, that the profession of music offers to the educated and trained musician who is blind a field in which he can work his way with least hindrance from his lack of sight, and many are they who have found in it a means of livelihood for themselves and their families. A few in nearly every school are certificated annually as tuners of pianos. Indeed, piano tuning, often joined as it is with piano selling, has become one of the very best occupations yet developed for the men. The public school pianos of several of our cities are regularly kept in order by tuners who are blind.

Since 1900, when the Pennsylvania institution moved to the suburbs of Philadelphia and laid out its play grounds and covered cloisters to invite open-air activities, increased attention to directed play and even to athletics by blind boys has been noticeable all over the country. Most institutions now have a good gymnasium and several have swimming pools.

Prior to 1900 the only systematic schooling given the blind was in residential institutions. Since then for various reasons, chiefly the supposed demands of the times, a number of cities have opened day classes for blind children in connection with the public schools. In such cases the blind pupils living in several school districts are united in one convenient centre or home-room under a teacher who coaches them for recitation in the grade rooms with the other children. The plan is feasible enough and is found to be successful in proportion as the teachers and those responsible for it are alive to the needs of the individual child and do not try to make him conform to the usual hours and the limitations of the common school system. Keeping handicapped children all the time in the community where they live and not even a part of the time off in special residential schools, as used to be deemed necessary, is doubtless a move in the right direction. But it must not be forgotten that children handicapped by lack of sight not only deserve but require enlarged and enriched opportunities of development; for it takes them longer to do things than it does children who see, and moreover they are far more dependent for balance and poise upon whatever training they get at school. In some cities having such centres private associations for the blind have tried to provide the needed supplementary training. Teaching the adult blind at home called "home teaching" is carried on in 13 States. Two States now (1917) conduct summer schools for a limited number of adults, using their institution plants for this purpose.

Books.— The American schools for the blind were founded upon embossed books. Dr. Howe states somewhere that the simple reading from embossed print did more to establish the schools in the country than any other one thing. Extraordinary pains were taken by Dr. Howe and his assistants to perfect a system which should be at once readily tangible to the fingers of the blind and legible to the eyes of their friends. The result was the small lower-case letter of Dr. Howe, the Boston line print, as it is often called. To this the jury gave preference before all other embossed systems exhibited at the great exhibition of the industry of all nations, in London, in 1851. Backed by such endorsement and all the authority of Dr. Howe, the system was rapidly adopted into the American schools. It was then the theory that the blind would be further isolated from their friends if their alphabets were dissimilar. The blind of themselves had devised a writable system—-arbitrary and composed of dots or points—one which they could both read and write. But the early superintendents would not countenance it. However, many of the blind failed to read the line-letter system; because to read it requires extreme nicety of touch, which all the blind by no means have. Characters composed of points, not of lines, are scientifically adapted to touch reading. In the 33d report of the New York institution, Supt. William B. Wait wrote: «Now, which is the more important, that all the young blind should be able to read, thus being made, in fact, like the seeing, or that they should be taught an *alphabet which in some sort resembles* that used by the seeing, but by doing which only 34 per cent of them will ever be able to read with any pleasure or profit?» This attitude of the New York school was the outcome of statistics gathered from seven institutions, in which 664 pupils were involved, and of experiments made by Mr. Wait with his own pupils, using a system scientifically devised by him, composed of points in arbitrary combination. This was in 1868. At the next convention of the American instructors of the blind, it was resolved «That the New York horizontal point alphabet as arranged by Mr. Wait should be taught in all institutions for the education of the blind.» Europe was a long time accepting a writable point system. That of Louis Braille. devised in 1829, though much used by individuals, was not officially adopted into the Paris school where it originated until 1854. In contrast, America devised, printed, spread and resolved to accept its writable system in less than one-half the time. The benefits of a tangible writable system are vast. It puts the blind more nearly on a par with the seeing, particularly as pupils in school. Its adoption here, next to that of tangible printing, makes obtainable the ideal of American schools for the blind. Every tangible system has its defects. French «braille» as adopted into England has antiquated abbreviations and contractions for the use of adults; and is involved with rules allowing much bad use, like the omission of all capitals. The New York point as printed also laid itself open to much criticism as to «good use.» The American braille, the latest system, combining the best features of French braille and of New York point, was devised by a blind teacher of the Perkins institution. It takes full account of «good use,» and those who use the system deem it very satisfactory. In 1892, when the American braille system was adopted into several schools, a typewriter for writing braille was invented, and this was followed by the invention of another machine for embossing braille directly on plates of thin brass from which any number of duplicates could be struck off on paper. Here was a means of creating a new library at once. But the chief value of the invention lay in the fact that as the machine was simple and inexpensive and could be operated if necessary by a blind man, any institution could have a printing office of its own. And several schools immediately established such offices, from which they issued at once whatever their school classes demanded. By co-operating in the selection of the books to be embossed these schools have created in a comparatively few years a library of books in American braille than which there is no superior in any system in any country, and they have added an immense amount of music in the braille music notation, which is the same all over the world. A typewriter and a machine for embossing brass plates in the New York point system promptly appeared also, and a great library of both books and music has rapidly been issued in this system, especially from the American Printing House for the Blind at Louisville, Ky.; so that in America we have the condition of two competing point systems when but one would obviously be enough. More than one system means duplication and therefore lessening both the book production and the reading done by the blind themselves. Seeking a way out of this dilemma, a group of especially competent blind people was created a «uniform type committee.» For several years it conducted tests in many States and in several countries, the funds being subscribed by private individuals, by themselves, by other blind people and their friends and by school printing plants. To-day the country seems to be on the eve of uniformity.

The United States Bureau of Education gives the number of embossed books in the country in the year 1915 as 127,247. The greater part of these are in the school libraries, thousands belonging to departments for the blind in public libraries; from both of these sources the circulation to the blind at home is surprisingly large. A fact mainly accountable for this is that such books pass through the mails postage free. There are now, besides fiction in great variety, periodical magazines embossed for finger reading, notably the *Matilda Ziegler Magazine,* a monthly appearing in no less than 15,000 copies. A journal of inter-communication among all agencies in behalf of the blind, a quarterly in common print, called the *Outlook for the Blind,* has been issued since 1907 and is of far-reaching service to all interested in work for the blind.

Higher Education.— The Association of American Instructors of the Blind, formed in 1871, has met biennially ever since, usually as guest of one or another institution. The proceedings of each convention have been published. The principles underlying the scheme for educating the blind being to make them as little as possible a class apart from the rest of the community, it has not been deemed wise to attempt to establish a national college for the higher education of those capable of taking it, but efforts are making toward enabling the brighter and worthier pupils to attend one of the colleges for the seeing, at the expense of the States or the schools from which they come. Seven states have already (1918) made appropriations of money for such higher education. The school instruction of the blind is comparatively an easy matter. That work is less of a science than the more difficult task of instructing the deaf. But training them vocationally or for social efficiency is usually difficult, and it is becoming more and more so as society grows in complexity, and the places easily open to the blind become filled by them. Since 1900, through the vastly increased attention given the adult blind by private associations and public commissions, which have opened new shops for their employment and increased the kinds of occupations provided them, the schools have made their curricula more definitely vocational, and moreover their superintendents have more and more actively assumed the responsibility not only of preparing their charges for something definite but even of providing them work or positions when leaving the shelter of school.

Vocational Statistics.— Blindness in itself does not necessarily unfit its possessor for employment or even self-support; and there are few occupations in which some blind person has not made good. But while it is usually easy to equip a blind person for a vocation, it is always difficult to place him, as the average employer of labor does not want him. This fact seriously militates against the potential economic success of the blind and has always done so. It tends to superimpose idleness upon blindness, which is tragedy indeed. And yet the blind are very properly classed as socially competent. The proposed plan of our government for doing its duty to those of its soldiers who are blinded in the great war, i.e., not only re-educating them but also finding or making places for those capable of filling them, is splendid and a most encouraging sign of the times. Even when back in 1878 an exhaustive census of the graduates from all over the country was compiled, it revealed the following facts: 16 became superintendents of other institutions; 214 became teachers or were otherwise employed in institutions; 34 became ministers of the gospel; 84 authors, publishers or lecturers; 310 were engaged as teachers of music or were vocalists outside of institutions; 69 had been organists in churches; 125 piano tuners; 937 had been engaged as teachers, employees and workers in handicraft; 277 were storekeepers, etc.; 45 became owners and managers of real estate; 760 (mostly women) were employed at housework at home or in families, or at sewing with machines, or by hand, and 78 were in homes of employment. Further, according to the census of the United States, while there were about 55,000 blind in the land, but 2,560 were found in almshouses. What proportion of these ever attended our schools will never be known, but it must be remembered that blindness is an affliction of old age.

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BLIND FISHES. See CAVE ANIMALS.

BLIND RIVER, Canada, town in the Algoma district of Ontario, on Lake Huron and Blind River, 70 miles east of Sault Sainte Marie and 80 miles west of Sudbury on the Canadian Pacific Railway. It has saw and shingle mills and machine shops, and is in a rich mineral district. Pop. (1911) 2,558.

BLIND SPOT. The place of entry of the optic nerve in each retina is insensitive to light. Mariotte in 1668 first demonstrated the existence of the blind spot. Its existence may be easily shown as follows: Pin a large sheet of paper against the wall so that a cross marked thereon may be at the level of the eyes; fix the position of the head by means of a headrest (a ruler about 50 centimetres in length, held by the teeth at one end, the other end resting against the paper, is a convenient headrest); with one eye closed or covered, look steadily at the cross with the other eye; move a pencil, that has been covered with paper so that the point only shows black, from the cross toward the temporal side of the field of vision; mark on the paper the position at which the pencil point disappears; move the pencil farther and mark the position at which the point reappears. By moving the point in various directions near this place on the paper, and marking the positions where the pencil point disappears, and reappears, a series of marks may be made which furnish an outline figure of the form of the blind spot. The diameter of the blind spot (1.5 mm.) corresponds to a visual angle varying from 3° 39′ to 9° 47′. The average is about 6°. An image of light sufficiently small, thrown upon the optic nerve by means of the ophthalmoscope, gives rise to no sensations. These experiments show that at the blind spot we see nothing, yet, as we look at this page with one eye only the surface appears to be covered with letters in the regular forms; there is no blank space corresponding to the blind spot. In binocular vision the blind spot of one retina is covered with a sensitive portion of the other retina. Why we should not be aware of our inability to see a continuous field with one eye is a problem for which there are two proposed explanations. The blind spot may be filled out by association, whose nature is determined by the character of the surrounding field, or by eye movements which serve as retinal local signs for the insensitive region. Probably the two processes are necessary and aid each other in presenting to the mind the continuous visual field. Consult Ladd, ‹Elements of Physiological Psychology›; Helmholtz, H. Von, ‹Physiologische Optik› (Hamburg 1911); Sandford, ‹Course in Experimental Psychology›, (ex. 113, 114); Wundt, ‹Physiologische Psychologie' (Leipzig 1910); Titchener, E. B., 'Experimental Psychology' (New York 1901).

BLIND TOM (Bethune, Thomas), a musical freak: b. about the middle of the 19th century; d. Hoboken, N. J., 13 June 1908. He was a negro slave in Georgia, and was born blind and with very weak mental development. He showed remarkable aptitude for music and after hearing a piece played once could reproduce it accurately on the piano. He also performed other musical wonders, and for several years was exhibited in various cities. After playing he would generally spring up and applaud himself. He reappeared on the stage in 1904–05, but being difficult to manage he was soon withdrawn. His lack of intellect developed into almost brutal idiocy.

BLINDAGE. See Camouflage.

BLINDNESS, a general term to denote partial or complete loss of vision. It is never a disease of itself, but results from a number of extremely diverse diseases, either of the eye itself, or of the nervous pathways which convey light stimuli. It may be a congenital condition also, and here the defect may be due to a great variety of causes. It is comparatively rare; according to the statistics of 1900 there were about 65,000 blind in the United States, i.e., about 1 in 1,000 of the population. In a few cases blindness has an hereditary character; the vast majority of the blindnesses result from accident or disease. Bullet wounds in war are the most frequent accidental causes. Disease of the cornea — inflammation (chiefly gonorrhœal) — is responsible for about one-fifth of the blindness in the community. This usually occurs at birth and is largely preventable. Various other disorders of the eyestructures — other than the purely nervous ones — cause blindness in a small number of cases. Actual injuries to the eyes in various occupations account for a small number.

Disease of the nervous pathways, i.e., the retina, optic tract, corpora quadrigemina, optic thalamus and occipital cortex result in various types of partial or complete blindness according to the localization of the disorder. Blindness from retinitis, i. e., inflammation or injury of the retina, may result from various poisons, alcohol, lead or certain infectious diseases, such as scarlet fever, typhoid, etc. Pressure within the brain from tumors may cause blindness. Injury to the optic nerves from tumor, from fracture of the skull, from the pressure of glaucoma, from bullet wounds, cause partial or complete blindness. Disease of the optic chiasm, chiefly hypophyseal tumors, causes a partial blindness — hemianopsia, as does injury to the receiving stations of the sight pathways in the corpora quadrigemina and the occipital lobes of the brain.

A special type of night blindness is a rare hereditary condition. These patients see well in the daytime but lose their power to see in the dusk or at night. Color blindness is another special type of blindness to certain colors. See Amaurosis; Ambylopia; Asthenopia; Blind; Eye, Diseases of; Hemeralopia; Nyctalopia. Consult Jelliffe and White, 'Diseases of the Nervous System' (1917).

Smith Ely Jelliffe.

BLINDS, screens or shutters to prevent too strong a light from shining in at a window, or to keep outsiders from seeing in. Venetian blinds are made of slats of wood, so connected as to overlap each other when closed, and to show a series of open spaces for the admission of light and air when in the other position.

BLINDSNAKE, a family of small serpents (*Typhlopidæ*) having worm-shaped bodies, only a few inches in length, very rigid, and suited for burrowing. These little snakes exist in all warm countries, and lead a subterranean life, worming their way through the loose topsoil, and feeding on earth-worms, grubs and insects. Their eyes, through disuse, have become minute and weak, and in many species almost covered by overlapping plates. In India they sometimes come out upon the surface after showers, when they are regarded with superstitious dread by the natives; but they are perfectly harmless. Many species inhabit Mexico and tropical America, two or three occurring in New Mexico and Texas, where they are frequently found in ant-hills.

BLINDSTORY. See Triforium.

BLISS, Aaron Thomas, American politician: b. Smithfield, N. Y., 22 May 1837; d. 16 Sept. 1906. He served in the Federal army during the Civil War, and was for six months a prisoner in Andersonville, Columbia, made his escape from the latter, and reached the Union lines after 18 nights of perilous travel through hostile territory. He rose to the rank of captain. In 1865 he settled in Saginaw, Mich., where he engaged in lumbering, banking and other business enterprises. He was elected to the State senate and was a member of Congress, 1889–91, was elected governor of Michigan in 1900 and re-elected 4 Nov. 1902.

BLISS, Cornelius Newton, American merchant and statesman: b. Fall River, Mass., 26 Jan. 1833; d. 1911. He was educated in New Orleans; entered his stepfather's counting-room there; engaged in the commission business in Boston, and became head of the dry goods commission house of Bliss, Fabyan & Company, New York, in 1881. He was a member of the Pan-American Conference; chairman of the New York Republican State Committee, 1877–78; and treasurer of the National Republican Committee in 1892, 1896, 1900 and 1904; declined to be a candidate for governor of New York in 1885 and 1891; and was Secretary of the Interior Department in President McKinley's Cabinet in 1897–98.

BLISS, Daniel, American missionary: b. Georgia, Vt., 17 Aug. 1823; d. Beirut, Syria, 28 July 1916. He graduated at Amherst College in 1852, and at the Andover Theological Seminary in 1855; was ordained a Congregational minister 17 Oct. 1855; engaged in missionary work in Syria in 1855–62; and in 1866 became president of the Syrian Protestant College of Beirut; president emeritus in 1902. His publications include 'Mental Philosophy' and Natural Philosophy,' both in Arabic.

BLISS, Edwin Elisha, American missionary: b. Putney, Vt., 21 April 1817; d. Constantinople, 29 Dec. 1892. He was graduated at Amherst College in 1837, and at Andover Theological Seminary in 1842; was ordained as a missionary in 1843, and joined the American

Mission in Turkey, being stationed at Trebizond, 1843–52; Marsovan, Armenia, 1852–56, and at Constantinople after 1856. In addition to the ordinary work of a missionary he edited, 1865–92, the *Messenger*, published at Constantinople in the Turkish and Armenian languages, and compiled a number of textbooks, notably the ‘Bible Handbook,’ in Armenian.

BLISS, Edwin Munsell, American missionary, editor and author: b. Erzerum, Turkey, 12 Sept. 1848; d. 6 Aug. 1919. Educated at Robert College, Constantinople; High School, Springfield, Mass.; Amherst College, A.B. 1871; Yale Divinity School B.D. 1877; D.D. Amherst College 1896; assistant agent of the American Bible Society for the Levant, headquarters at Constantinople 1872–75, 1877–88; traveled in Turkey, Persia, etc.; associate editor *The Independent* 1891–1901; chairman committee on publication on the press, Ecumenical Missionary Conference, New York 1900; secretary Bureau of Missions; agent of the American Tract Society for New England. After 1907 expert special agent Bureau of the Census, Washington, D. C.; editor of the ‘Encyclopædia of Missions’ (1891); author ‘The Turk in Armenia, Crete and Greece’ (1895); ‘A Concise History of Missions’ (1897); ‘The Missionary Enterprise’ (revised edition of Concise History), (1907); editor ‘Census Report on Religious Bodies’ (1910); ‘Report on Benevolent Institutions’ (1914); ‘Summary of State Laws Relating to Dependent Classes’ (1915).

BLISS, Frederick Jones, American explorer: b. Mount Lebanon, Syria, 23 Jan. 1859. In 1880 he was graduated at Amherst; spent three years as principal of the preparatory department of the Syrian Protestant College at Beirut. Later he studied theology at the Union Theological Seminary but did not enter the ministry. He conducted private researches in Syria and in 1890 began his connection with the Palestine Exploration Fund. He had charge of excavations at Tell-el-Hesy and at Jerusalem. He discovered the first cuneiform tablet uncovered in Palestine. He has also made an especial study of Syrian pottery. He was Dean for men at the University of Rochester in 1911–1914. He has published ‘A Mound of Many Cities’ (1892); ‘Excavations at Jerusalem, 1894–97’ (1898); ‘Excavations in Palestine, 1898–1900’ (1902); ‘The Development of Palestine Exploration’ (1906); ‘Religions of Modern Syria and Palestine’ (1912).

BLISS, George, American lawyer: b. Springfield, Mass., 3 May 1830; d. near Wakefield, R. I., 21 Sept. 1897. He was graduated at Harvard College in 1851; studied for two years in Berlin and Paris and traveled in Sweden, Germany, Switzerland, Italy, Spain and Portugal, and after his return read law principally at the Harvard Law School. He established himself in practice in New York. In 1859–60 he was private secretary to Governor Morgan of New York; in 1861 he was appointed to his staff; in 1862 he became paymaster-general of New York; and in that and the following year organized three regiments of United States colored infantry under instructions from the Secretary of War and representing in this service the Union League Club of New York. In 1866 he was appointed attorney for the Metropolitan boards of excise and health; in 1872 United States attorney for the southern district of New York, and in 1881 a special assistant to the United States Attorney-general for the prosecution of the «Star Route» postal cases. In 1895 he was decorated by Leo XIII with the order of Saint Gregory the Great for his defense of the Roman Catholic charitable institutions of New York before the Constitutional Convention of 1894. He drafted the New York charter of 1873; drew up the New York Consolidation Act, and was author of the first Tenement House Act for the city. He published three editions of the ‘Law of Life Insurance’ and four editions of the ‘Annotated Code of Civil Procedure.’ He was also a contributor to the *North American Review.*

BLISS, Howard Sweetser, American Congregational minister and educator: b. Mount Lebanon, Syria, 6 Dec. 1860; d. 2 May 1920. He was graduated from Amherst College in 1882, Union Theological Seminary, New York city, 1887; studied at Oxford (Mansfield College), at Göttingen and Berlin. He was ordained in 1890; until 1894 was assistant pastor of Plymouth Church, Brooklyn; pastor of the Christian Union Church in Upper Montclair, N. J., 1894 to 1902, when he succeeded his father, Daniel Bliss, as president of the Syrian Protestant College in Beirut.

BLISS, Philip Paul, American musician and evangelist: b. Clearfield County, Pa., 9 July 1838; killed in railroad accident, Ashtabula, Ohio, 29 Dec. 1876. He received some musical instruction from G. W. Root, but was very largely self-taught. He became popular as a music teacher in the West, and prominent in the musical conventions conducted by Bradbury, Root and others, afterward becoming a successful conductor of such gatherings. His evangelistic work was done chiefly in conjunction with Maj. D. W. Whittle and D. L. Moody, who became his warm friend and admirer. He had a fine personal presence, a gift of ready and effective speech, and these, combined with his wonderful voice, which appealed strongly to the hearts of the multitude, gave him great power over his audiences. He frequently composed both the words and the music of the songs which have made his name known throughout Christendom. Of these the most popular are ‘Hold the Fort, for I am Coming’; ‘Down Life's Dark Vale We Wander’; ‘Jesus Loves Me’; ‘Hallelujah! 'Tis Done,’ and ‘Pull for the Shore, Sailor.’ His services as a revivalist were in demand throughout the United States and Canada. His songs appeared in the following named collections: ‘The Charm’ (1871); ‘The Song Tree’ (1872); ‘The Joy’ (1873); ‘Gospel Songs’ (1874).

BLISS, Porter Cornelius, American journalist and diplomatist: b. Erie County, N. Y., 28 Dec. 1838; d. New York, 2 Feb. 1885. He was educated at Hamilton and Yale colleges; became private secretary to James Watson Webb, United States Minister to Brazil, in 1861; explored the Gran Chaco for the Argentine government; compiled the various Indian dialects and investigated the antiquities of that region; and in 1866 became private secretary to Charles A. Washburn, United States Minister to Paraguay. He was commissioned by President Lopez to write a history of Paraguay, and while doing so war broke out between that country and Brazil, and he was imprisoned and tortured on suspicion of being a Brazilian spy. It required the presence of an American squadron to effect his release. In 1869–70 he edited the Washington *Chronicle;* in 1870–74 he was secretary of the United States legation in Mexico, and during that time made several archæological explorations and wrote on the opportunities of American enterprise in that country. In 1874–78 he was an associate editor of 'Johnson's Universal Cyclopædia'; in 1877 was editor of 'The Library Table,' and in 1879 went to South America as correspondent for the New York *Herald.* He wrote numerous papers of historical value and wrote a history of the Russo-Turkish War (1877).

BLISS, Tasker Howard, American soldier: b. Lewisburg, Pa., 31 Dec. 1853. He was graduated from the United States Military Academy in 1875, and with honors from the United States Artillery School in 1884. A scholarly soldier, he has acted in numerous capacities involving technical capacity beyond the range of strategy and tactics. In 1884 he was nominated recorder to the board appointed by the President to report on the military value of the interior waterways of the United States; he was professor of military science at the United States Naval War College from 1885 to 1888; aide-de-camp to Lieutenant-General Schofield, and inspector of rifle practice 1888–95. For the next two years he was on special duty with the Secretary of War, and military attaché at the American legation at Madrid until the outbreak of the Spanish War. He served in Porto Rico and Cuba, and subsequently became collector of customs at Havana and chief of the Cuban customs service. In 1902 he was made brigadier-general and appointed member of the Army War College Board, becoming commandant of the college in 1903. After holding commands in the Philippines he was appointed assistant chief of staff in 1909, and spent some time in southern California on the Mexican border. Between 1911 and 1915 General Bliss filled various important commands and again became assistant chief of staff in February 1915; a member of the Joint Army and Navy Board in September, and major-general in November. On 22 Sept. 1917 General Bliss was named chief of staff of the army. He was commissioned general 6 Oct. 1917 and was retired by operation of the law 31 Dec. 1917. He was a member of the Allied Conference, 1917, a member of the Supreme War Council in France, and a member of the American Commission to Negotiate Peace which met in Paris, 1918–19, and drafted the Treaty of Versailles.

BLISS, William Dwight Porter, American clergyman: b. Constantinople 1856. He was graduated at Amherst College in 1878, and at Hartford Theological Seminary in 1882; was ordained a Congregational clergyman; became an Episcopal priest in 1887; organized the first Christian Socialist Society in the United States in 1889, and was president of the National Reform League. He edited *The Dawn* (1889–96); *The American Fabian* (1895–96); and the 'Encyclopædia of Social Reform,' and published a 'Handbook of Socialism.'

BLISS, William Julian Albert, American physicist: b. Washington, D. C., 22 Jan. 1867. He was graduated at Harvard University in 1888 and pursued a course of studies in electrical engineering and physics at Johns Hopkins, Baltimore, at which university he received the Ph.D. degree in 1894 and subsequently became assistant in physics 1895–98, associate 1898–1901, and professor in the latter year. He has published 'Manual of Experiments in Physics' (with J. S. Ames, 1897), and other works bearing on his profession.

BLISTER, a local collection of blood serum beneath the cuticle. Blisters may be produced by a variety of agents. In all instances, however, there is irritation of the part; this is followed by dilated blood vessels and an exudation of the serum from the blood vessels near the irritant. Medicinally, blistering agents or irritants may be classified in four principal groups, as follows: rubefacients, when redness alone is produced; vesicants, when blistering is brought about; pustulants, when the blisters are usually small and contain pus; and escharotics, when burning or destruction of tissue may take place. Heat is an excellent illustration. Mild heat will cause redness; temperature above 125° to 400° F. will cause blistering; temperature above 400° will burn; and high temperatures can char. The most commonly used blistering agents are heat (the hot iron being lightly touched to the skin), mustard, capsicum, mezereum, turpentine and cantharides. The hot iron and cantharides are preferred, because their action can be controlled. Mustard mixed with cold water makes an excellent rubefacient, but it is not advised to be used as a vesicant. Blisters are used to influence deep-seated and chronic joint, muscle and tendon troubles. For general purposes of counter-irritation rubefacients are more serviceable than vesicants.

BLISTER-BEETLE, or **SPANISH FLY,** an oil-beetle of the family *Meloidæ,* in which there is a small head and a distinct neck; the wing-covers and sides of the body are without any coadaptation, while each claw of the feet bears a long appendage closely applied beneath it. The integument is soft, flexible, and many of the species contain a substance which forms an active vesicant, called cantharadine. The Spanish fly (*Lytta vesicatoria*) is larger than any of our native species, being about an inch long, is of a bright shining green, and when powdered and applied to the skin raises blisters. It inhabits the south of Europe, and is usually imported from Spain. Our native blister-beetles, when dried, can also be used for producing blisters or making blister-plasters. They are black or gray, and occur on potato plants, on the flowers of the golden-rod, etc. Their transformations are wonderfully complicated, since they pass through more than one larval stage (see METAMORPHOSIS). The females lay their eggs in the earth; the young, on hatching, are of a singular primitive shape, called a "triungulin," which is very active, entering the egg-pods and devouring the eggs of locusts. It soon molts, assuming a different but still active larval stage; it molts again, entering its third larval stage, when it resembles the grub of a May beetle (scarabæid stage). In the fourth stage the grub is helpless, lying on one side; it increases rapidly in size, and when fully grown leaves the remains of the egg-pod it has been living on and forms a small cavity near by. Here it lies motionless on its side, but gradually contracting till the skin separates and is pushed down to the end of the body, disclosing the semi-pupa or coarctate larva, which hibernates. In the spring the skin bursts and discloses a sixth larval form like the fourth. In this stage it is again active, burrowing in the earth, but taking no food, and in a few days passes into the pupa state. Other species of the family pass through a similar hypermetamorphosis. It is gathered from its food-plants, privet, lilac, etc., at night, by beating the bushes and catching the aroused insects in a cloth. They are then killed by immersing them in hot fluids, usually vinegar and water, are dried and then bottled. Administered internally cantharadine ($C_{10}H_{12}O_4$) causes serious inflammation of the throat, stomach and intestines, and large doses are sufficient to cause death. Commercially there are various preparations of blister-beetles, such as cerate of cantharides, tincture of cantharides, plaster of cantharides, etc.

BLISTER-STEEL. See STEEL MANUFACTURE.

BLITHEDALE ROMANCE, The, the third of Nathaniel Hawthorne's romances, published 1852. It was the outcome of an intimate acquaintance with the members of the Brook Farm (q.v.) Community, and immortalized the brief attempt of that little group of transcendentalists to realize equality and fraternity in labor. It is more objective and realistic than Hawthorne's other works, and therefore in a sense more ordinary. Its central figure is Zenobia, a beautiful, intellectual, passionate woman; drawn as to some outlines, perhaps, from Margaret Fuller. At the time it opens she has taken up her abode at Blithedale Farm, the counterpart of Brook Farm. The other members of the community are Hollingsworth, a self-centred philanthropist; a Yankee farmer, Silas Forster, and his wife; Miles Coverdale, the relater of the story; and Priscilla, who is Zenobia's half-sister, though of this fact Zenobia is ignorant. ‹The Blithedale Romance› is a brilliant instance of Hawthorne's power as a story-teller. No scene in the whole range of fiction is more realistic than the finding of Zenobia's body in the dead of night; drawn from the dank stream, a crooked, stiff shape, and carried to the farmhouse where old women in nightcaps jabber over it. Nothing could be more in the manner of Hawthorne than his comment that if Zenobia could have foreseen her appearance after drowning, she would never have committed the act.

BLIZZARD, a peculiarly fierce and cold wind, accompanied by a very fine, blinding snow which suffocates as well as freezes men and animals exposed to it. The origin of the word is popularly conceded to the United States where there is evidence of its use as early as 1840; recent investigations have shown that it is used in the local dialect of Lancashire, England, where it has been traced back over several centuries and is generally written «bleasard.» It came into general use in American newspapers during the bitterly cold winter of 1880–81, and has been in more or less general use since 1888. Such a storm comes up very suddenly and overtakes the traveler without premonition. The sky becomes darkened, and the snow is driven by a terrible wind which comes with a deafening roar. One of the most severe of these storms recorded in the West was that of January 1888 which extended from Dakota to Texas. The thermometer in some places fell from 74° to —28° F., and in Dakota to —40°. The number of deaths amounted to 235. Children were frozen on their way home from school, and farmers in their fields, and travelers were suffocated by the fine snow. The blizzard which will long be remembered in the Eastern States began 11 March 1888, and raged until the 14th, New York and Philadelphia being the cities most affected. The wind at one time blew at the rate of 46 miles an hour. The streets and roads were blocked, railroad trains snowed up for days, telegraphic communication cut off and many lives were lost. Blizzards are due to a southward flow of a large mass of cold air which is being pushed out from a centre of high barometric pressure. The flow progresses regularly according to the differences of density and pressure on either side of its front line of advance. This regularity of advance has been turned to account by the United States Weather Bureau, which is able to forecast with great accuracy the advance of a blizzard, and thus in almost every case the populations affected are amply forewarned.

BLIZZARD STATE, a nickname formerly given to Dakota Territory.

BLOAT, HOVEN, or **TYMPANITES,** a diseased condition of sheep or cattle, consisting of distension of the first stomach (rumen) and commonly caused by an overabundance of leguminous diet. Animals unaccustomed to graze in clover are liable to the malady, but overeating of grain may also produce bloat. The use of cathartic remedies, such as Epsom salts or linseed oil, will often prove effective, except in severe cases. One pound of linseed oil or a pound of Epsom salts is the proper dose for a cow and one-fifth this amount for a sheep. Sometimes the accumulation of gas in the rumen is so abundant and distressing that relief must be obtained by an incision made by a surgical instrument at a point on the left flank midway between the last rib and the lumbar vertebræ. This operation is generally performed by a veterinary surgeon.

BLOCH, Jean de, Russian financial administrator, pacifist and author: b. Radom 1836; d. 1902. His parents were Polish Jews. He became government administrator of the railway system connecting the Baltic and the Black seas, and besides extensive industrial and commercial activities was continually interested in the economic betterment of the poorer classes. He also became widely known as an advocate of universal peace by his contributions to French, German and English periodicals and by his museum at Lucerne. In his great work, ‹The Future of War in its Technical, Economic and Political Relation› (7 vols., Saint Petersburg 1898), translated and abridged by R. C. Long and published in England as ‹Is

War Now Impossible?› (1899), he contends that under modern conditions a war would last so long that it would result in the exhaustion and starvation of the warring powers, in revolution and the destruction of the state, and therefore was not likely to occur.

BLOCH, Karl Heinrich, Danish painter: b. Copenhagen 1834; d. 1890. He studied at the Copenhagen Academy and in 1852 went to Italy where he spent about 12 years. In 1883 he became a professor in the academy in which he had been trained. Although his chief paintings are historical, he was also successful in nature-studies, and some of his pictures are notable for their humorous characteristics. Among his works are ‹Peasant's Cottage› (1858); ‹Roman Street Barber› (1864); ‹James of Scotland Visiting Tycho Brahe› (1871); ‹Christian II› (1871), and two frescoes in the Copenhagen University. Consult Hannover, ‹Dänische Kunst des 19ten Jahrhunderts› (Hanover 1907).

BLOCH, Marcus Eliezer, German naturalist: b. Anspach (of poor parents) 1723; d. 1799. In the 19th year of his age he understood neither German nor Latin, nor had he, with the exception of some rabbinical writings, read anything. Nevertheless he became tutor in the house of a Jewish surgeon in Hamburg. Here he learned German and Latin, and besides acquired some knowledge of anatomy. He went to Berlin and devoted himself to the study of anatomy and natural history. His principal work is the ‹Natural History of Fishes› (12 vols., Berlin 1785–99), adorned with many colored plates, and long the most comprehensive work in its field and still useful for its pictures.

BLOCK, or BLOK, Adriaen, Dutch navigator who visited Manhattan (now New York) about 1613 and again in 1614 in the *Tiger*. This ship being accidentally burned, he built the *Unrest,* a craft of 16 tons, in which he coasted as far north as Nahant, discovering the Housatonic and the Connecticut rivers and the island which bears his name. See BLOCK ISLAND.

BLOCK, a mechanical contrivance consisting of one or more grooved pulleys mounted in a casing or shell which is furnished with a hook, eye, or strap by which it may be attached to an object, the function of the apparatus being to transmit power or change the direction of motion by means of a rope or chain passing round the movable pulleys. Blocks are single, double, treble or four-fold, according as the number of sheaves or pulleys is one, two, three or four. A running block is attached to the object to be raised or moved; a standing block is fixed to some permanent support. Blocks also receive different denominations from their shape, purpose and mode of application. See TACKLE.

BLOCK BOOKS. Before, and for a short time after, the invention of printing, books printed from wooden blocks, each the size of a page and having the matter to be reproduced, whether text or picture, cut in relief on the surface, were called block books. These popular blocks were adorned with crude paintings, the makers of block books and card painters being the same till about the opening of the 15th century. As their work increased in favor they devised the process of block printing, cutting into wooden blocks or metal plates in such a manner as to leave letters and pictures in relief, and after applying color to these, taking impressions from them. One or both sides of the sheet were printed from these blocks. See also PRINTING.

BLOCK COAL, the name of certain kinds of non-coking bituminous coal of Ohio and Indiana having a tendency to break into forms approaching the cube. See also COAL.

BLOCK ISLAND, an island in the Atlantic Ocean, midway between Montauk Point, L. I., and Point Judith, R. I., eight miles long, and from two to five miles wide. It belongs to the State of Rhode Island, from the shore of which it is about 10 miles distant. It has become a noted summer resort, and constitutes the township of New Shoreham, Newport County, R. I. There are lighthouses on its northern and southern extremities. The island was named by Adriaen Block, who reached here in 1614. It was first settled in 1662 and was taken by French privateers in 1689. A ship with emigrants from the Palatinate was wrecked here in 1720. The accident is recorded in Whittier's ‹The Palatine.› Pop. (1910) 1,314. Consult Livermore, ‹History of Block Island from 1614 to 1876› (Hartford 1877).

BLOCK PRINTING. See PRINTING.

BLOCK SIGNAL SYSTEM, the method of protecting railroad trains in motion, through the dividing of the road into sections, or «blocks,» in which but one train is allowed at a time on the same track. The system is operated through signals which have the effect of strict orders to the engineer and conductor in charge of any train.

The real benefits from the block system are increased safety for trains, and economy and increased facility in train operation. Increased safety is gained in three ways: (1) By keeping trains on the road not less than a fixed minimum distance apart, thus reducing to the lowest figure the risk of collision, either from trains overtaking each other, or opposing trains meeting on single track; (2) by the responsible corps of signalmen, who have a full view of passing trains and of the tracks for considerable distances, and are in regular communication with the track-walkers and other watchmen, and are equipped to stop trains in time to save serious trouble from defective train appliances and road-bed; (3) by demanding of trainmen and enginemen greater vigilance and the habit of being alert at all times for signals, which, under the block system, are comparatively close together. Economy and increased facility in the operation of the train service are ensured by the fact that irregular trains are prevented from doubling up and causing blockades at passing and other points where track room is limited. They also follow from the greater uniformity in the arriving of irregular trains at terminals, which distributes more evenly the yard work of handling cars and power, and thereby also reduces traffic expenses, as the yard work can then be done more economically than when there is a rush at one time and a standstill at another. All signal systems are required to provide for the diverse conditions existing on a single-track line and the double-track line. In double-track blocking only the movements of trains in following each other have to be provided for, while single-track blocking has to do this, and, in addition, guard against trains meeting head-to-head. Therefore, double-track blocking may be distinguished by the divisional title of «non-following block,» in contradistinction to that of «non-meeting block,» for single-track blocking. While single-track blocking must govern both the non-meeting and the non-following movements, its main object is to control the non-meeting (head-to-head) movements, which are the more important. To accomplish this, it should provide for holding a train at a passing siding while another train moving in the opposite direction is approaching that point. There are two principles in single-track blocking which should always be kept in mind. First, all meeting and passing points must be at block stations. Second, for the non-meeting movements that section of the line between the passing sidings must be operated *as one* block, regardless of intermediate block stations.

In single-track operation where block signals are not in use, trains on the main track are operated and passing points are fixed upon the authority of time-tables and train orders. The problem is to safely move the maximum number of trains in both directions on the same piece of track and so to fix their passing points as to cause the minimum amount of delay. In general, the movement of trains is made from one passing siding to another. The field of railroad signaling is one which has been prolific of a multitude of safety devices, arranged into many competing systems; but the fundamental wisdom of the establishment of «blocks» has been recognized by all inventors. On the practical side, the railroads have reduced the acceptable systems as proposed to a simple classification of four variations: (1) The manual system; (2) the controlled manual system; (3) the semi-automatic system; (4) the automatic system. In the manual system all signals are made directly by an individual signalman at the entrance to each block. As a rule he is in telegraphic or telephonic communication with the signal operators at the farther ends of the block stations on either side of him. In the controlled manual system the block is opened by the «clear» signal given by the operator, but the setting of this signal electrically sets the signal at the farther end of the block at «stop,» which, in turn, must be opened to «clear» by the operator at that station. In the semi-automatic system the train entering a block sets the signal at that point at «stop» and holds it at that position until it has passed safely into the next block. It is then released, but the signal operator must set it at «clear» before the next train can enter that block. In the automatic system all signals are operated by the moving trains, without any attention from operators except at switching points.

Except in automatic blocking, the signals are operated from signal towers, built beside the tracks, by means of levers resembling the reverse lever of a locomotive, which are connected with the signals by wires or pipe. If wire is used, there should be two lines for each signal, one for pulling it to «danger» and the other for pulling it back to «safety.» To ensure the signal being set at «danger» in the event of the breaking of the wires, the blade should be provided with a counterweight. Usually there is a lever for each signal, but in some instances, as at an interlocked point, one lever may be used to operate several signals, by means of a device known as a *selector*.

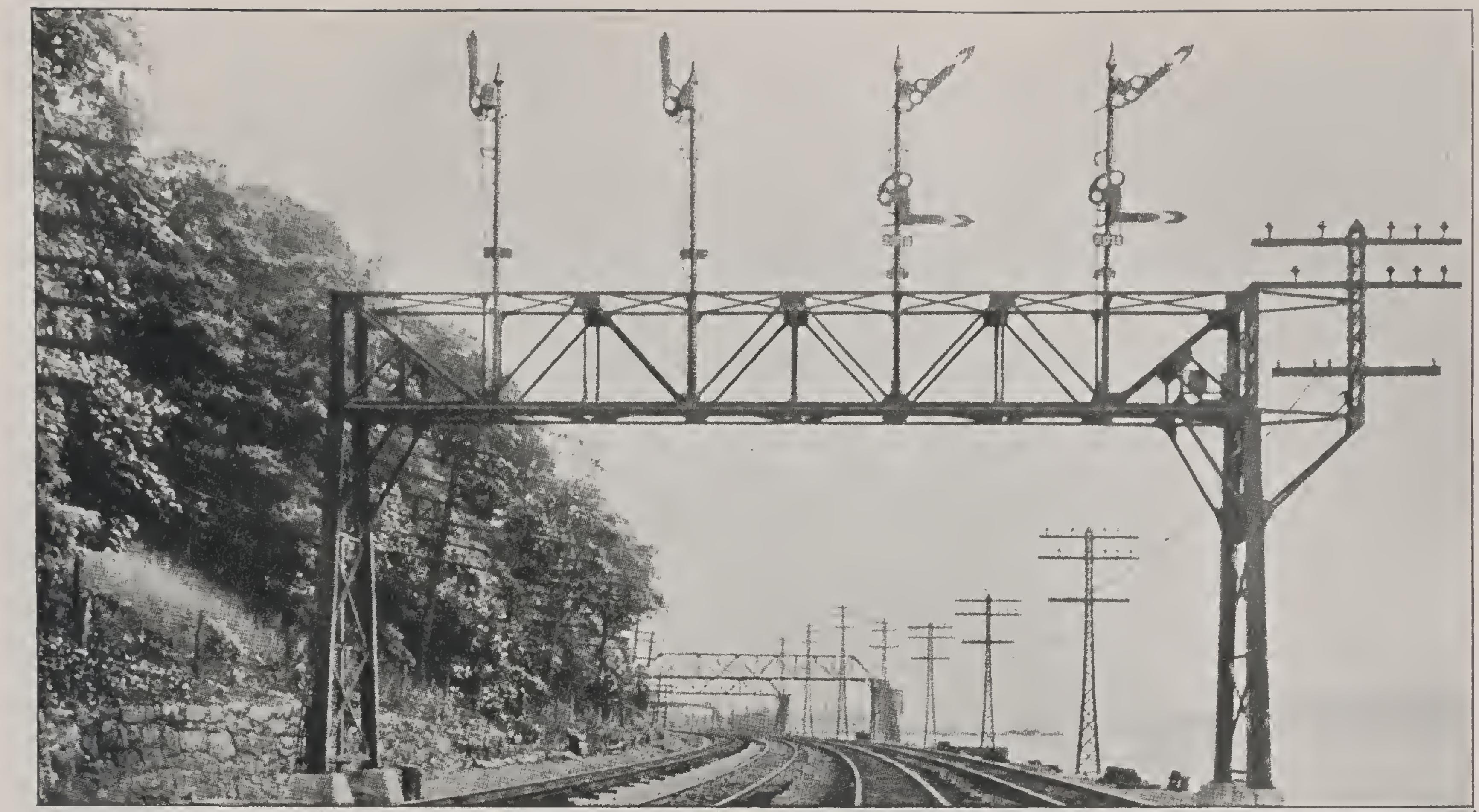
Manual Blocking.— In manual blocking each signalman controls the block signals at his station and, in the absence of other means, the code signaling between the block stations is done by means of electric bells. The more important lines use an *indicator,* giving a visual indication of the condition of the block. On the dial of the indicator appear the words «line clear,» «train on line» and «line closed.» By placing the hand of the indicator over any of these formulas the instrument at the other end gives a like indication. The instrument is not interlocked with the outdoor signals. The term «line closed» means that the instrument is out of service as there is no traffic in the block for the time being. This is the normal position of the pointer, giving a negative indication. In many of the larger signal towers the indicator is equipped with small red electric lamps which light up with the passing of trains into the block and remain alight until the block is again clear. In the Mozier manual system the passage of a train into a block is controlled by the train dispatcher, no train being allowed to enter a block without his permission. When a train enters a block the dispatcher is notified of the fact by wire and he then directs the signalman at the station in advance of the train what signal to display to the train on its arrival there.

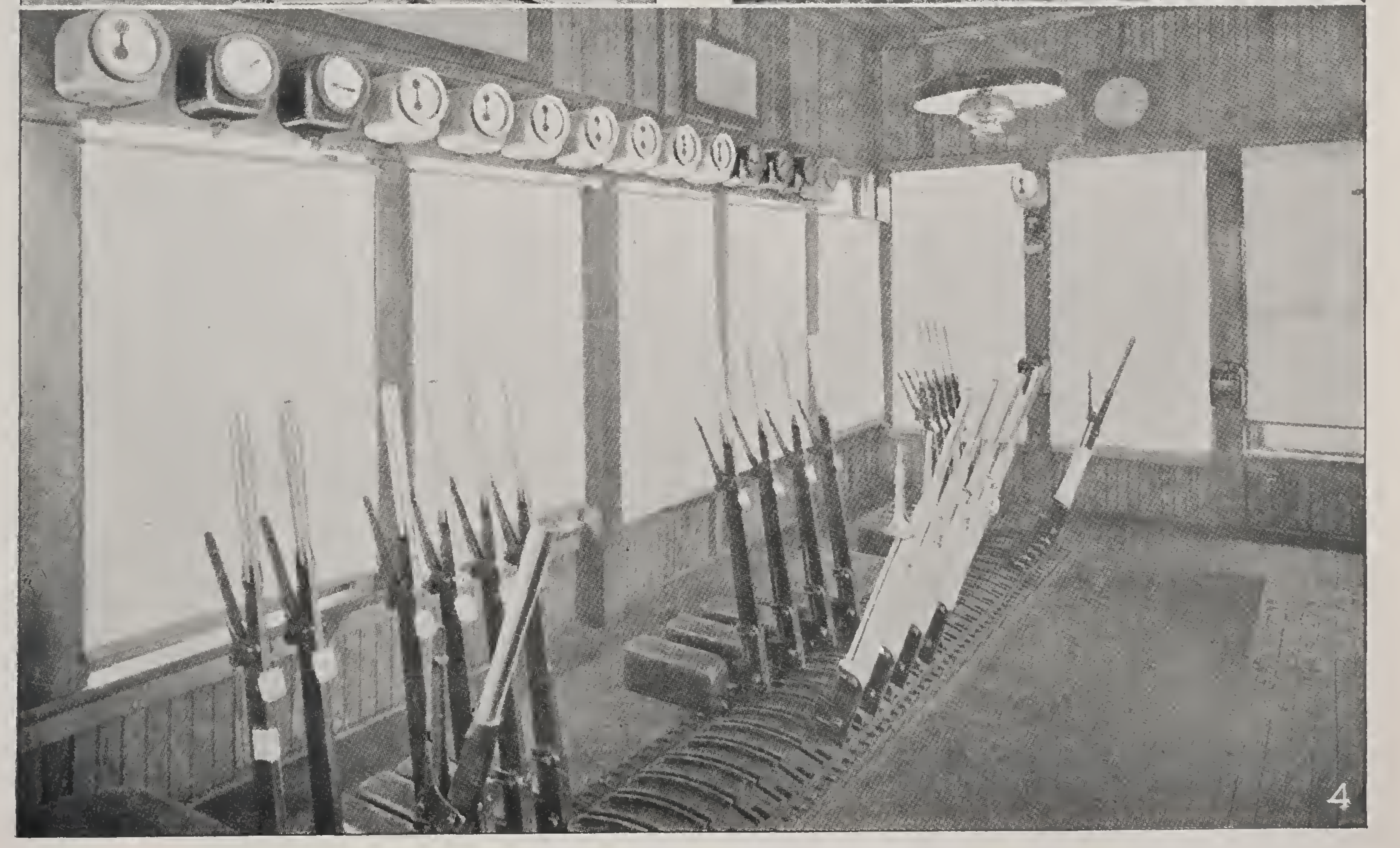
Controlled Manual Blocking.— In controlled manual blocking the manipulation of the outdoor signals at the entrance to a block is controlled, electrically, by the signalman at the block station in advance. In what is sometimes termed the automanual system there is at each block station a track circuit of at least two or three rail lengths, which is used in actuating an «electric slot» for automatically replacing the home signal to «danger» when the rear end of a train passes that signal. The locking instruments are generally placed in front of the signalman and over the levers with which they operate. Each block station has one of these instruments for each block, the two instruments at the opposite ends of a block being connected by an electric circuit. The code signaling between the stations is sometimes accomplished by bell.

In some instruments the signal-operating levels are normally locked, except when unlocked by the signalman at the station in advance, while in others the signals are locked only when the line is blocked by a train, thereby leaving them free to be thrown to either «danger» or «safety,» as may be desired, when the line is clear. In some instruments the electrical apparatus and the levers are connected electrically; in others they are connected mechanically.

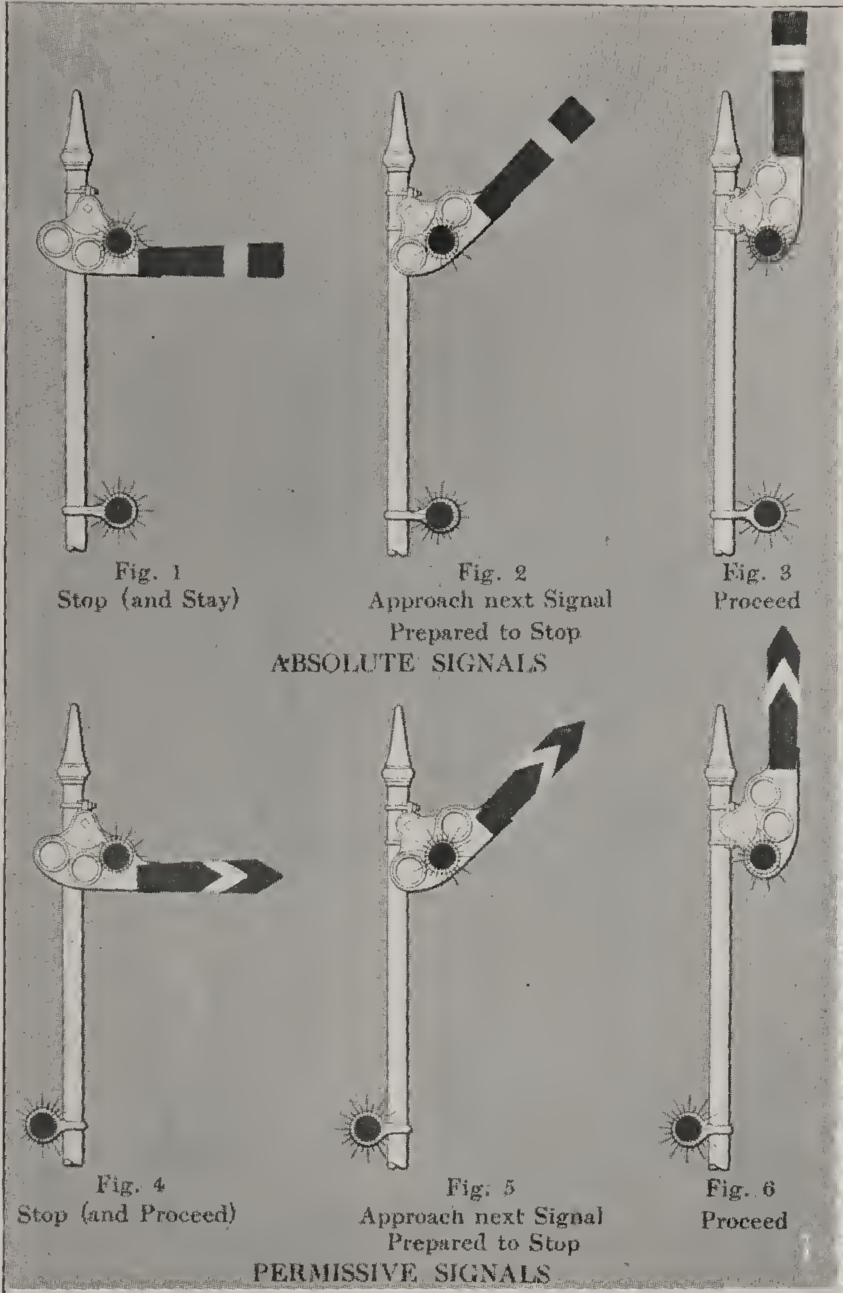
The «electric slot» is an appliance for automatically cutting out the block signal from its actuating lever, and is used to automatically return the signal to «danger» behind a train. It is actuated by a track circuit, as heretofore mentioned, placed ahead of the signal, and forms a removable connection between the sig-

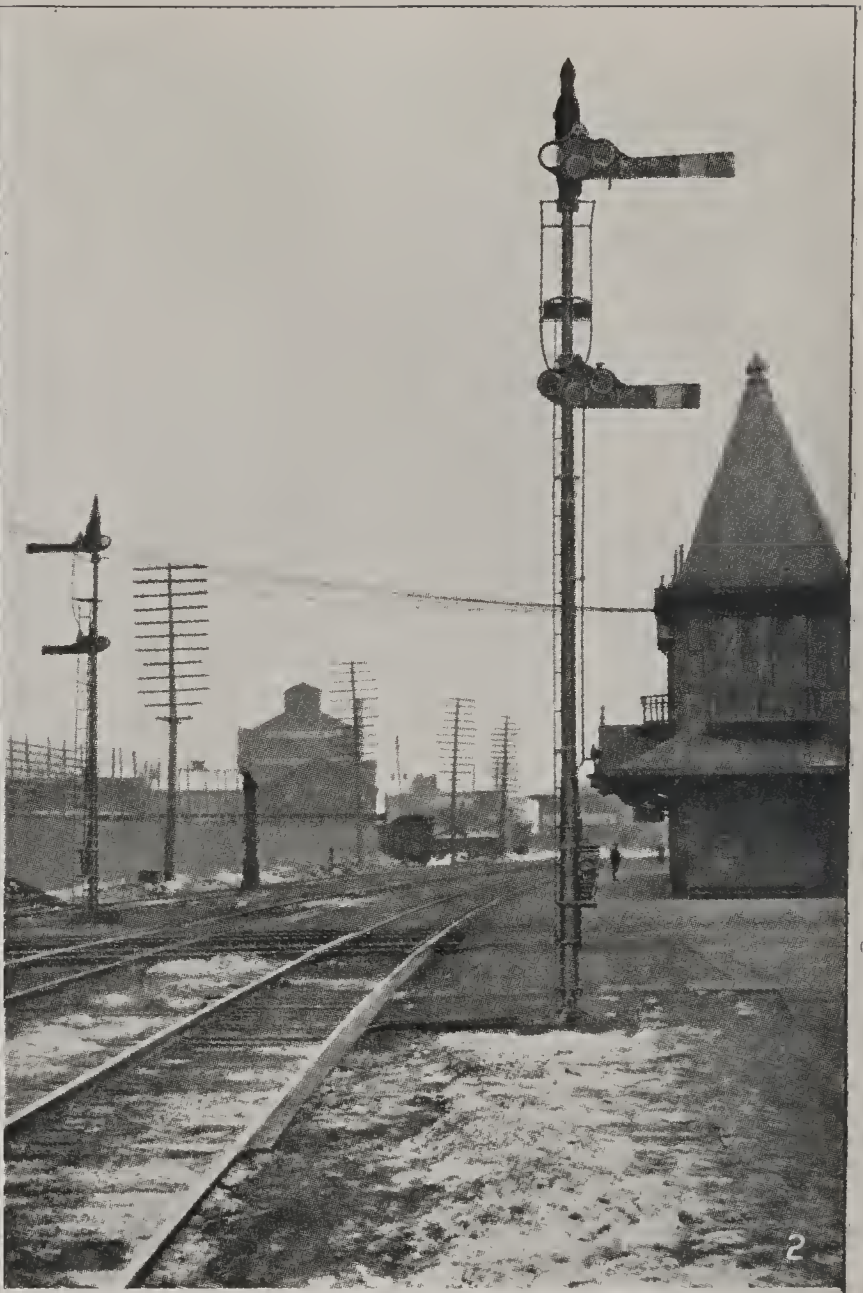
BLOCK SIGNALS

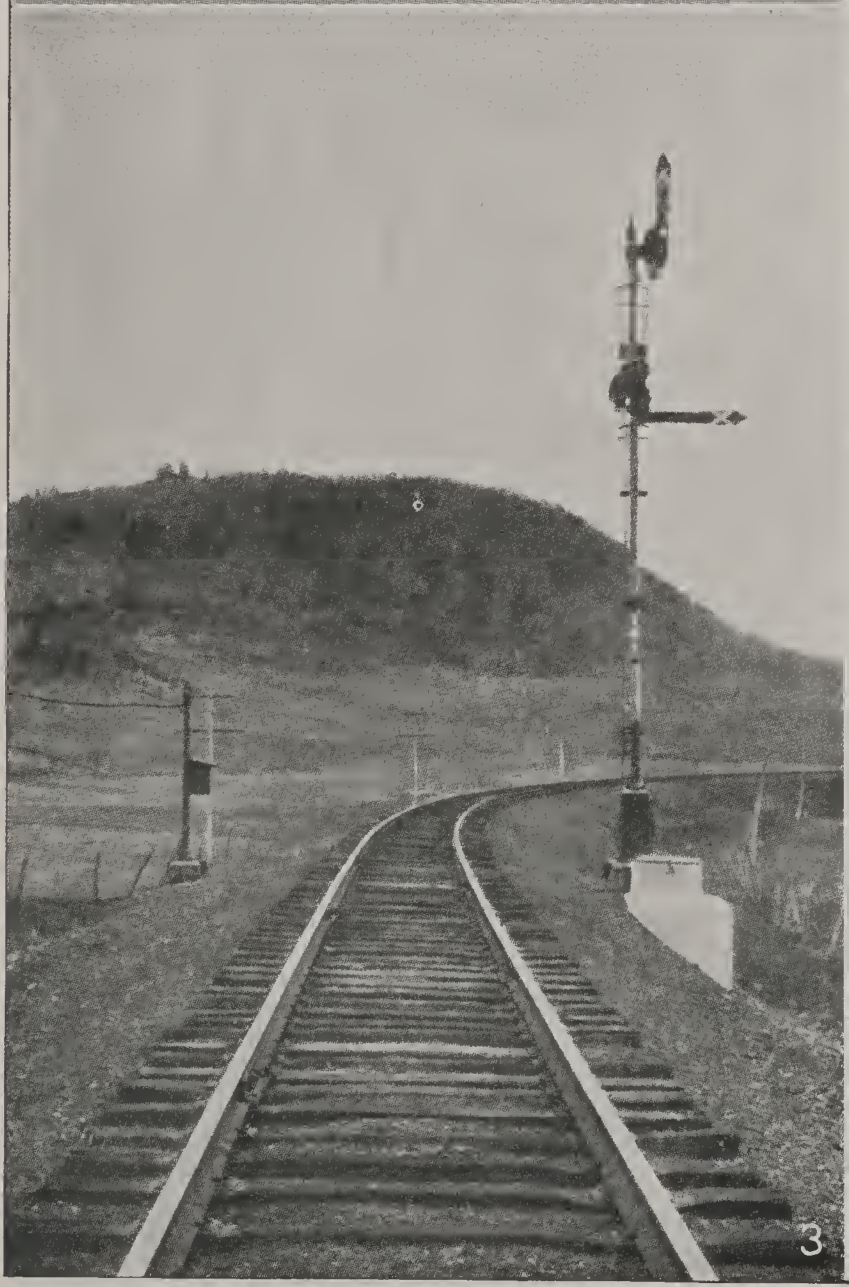




1 Power signals 2 Clear Signal 3 Alternating Current Signals. Signal Location on Single Track
4 Tower Indicators







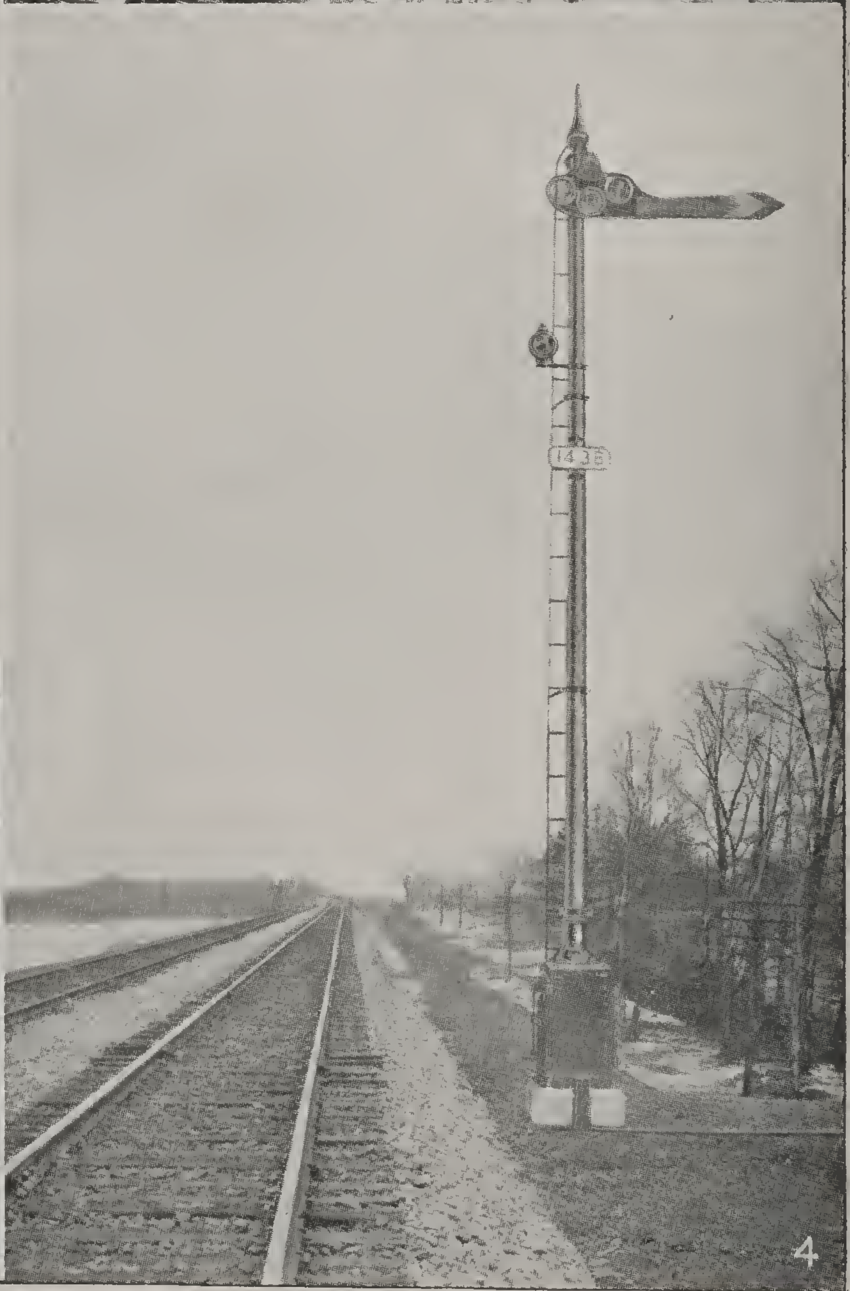


Fig. 1 Signal Aspects and Indicators used in Automatic Block Signaling Fig. 2 Single Electro — Mechanical Slot
Fig. 3 "Tonnage" signal used in Absolute Permissive Block System to facilitate traffic on ascending grades. The upper arm is the permissive signal; the lower arm is the "tonnage" signal Fig. 4 Three position Electric Motor Signal. Bottom Pole Type

nal counterweight and the signal rod, which connection, if removed when the signal is in the «clear» position, permits the signal to return to «danger» by force of gravity. The signal cannot again be placed at «safety» until the signal lever has been placed in its normal («danger») position. This device, therefore, prevents a signalman, after having allowed a train to enter a block, from carelessly and prematurely releasing the signal at the rear station while a train is in the block.

To ensure absolute safety for the main track in a block, including the territory for at least 1,000 feet ahead of the home signal at the station in advance (or a greater distance on a down grade), the main track switches at such advance station (including those within the 1,000-foot limit), and all outlying switches in the block, must be electrically interlocked with the block station in the rear, so that the signals at the station in the rear, which control the entrance to the block, cannot be placed at «clear» when the main track is occupied, or is fouled by a train on a side track, or when a main track switch is thrown for a side movement, or a main track «back up» signal is set for a backward movement. This system applies only to the operation of trains under the *absolute* block system.

Trains may run up to, but not beyond, home or advance signals at «danger.» They must not proceed until the clear signal or proper authority to pass the «danger» signal is given. When a distant signal is at «caution» trains may pass it under control, prepared to stop at the home signal. Home, advance and distant signals at «safety» may be passed without reducing schedule speed. A train that is to be held at an advance signal must first be brought to a stop at the home signal. It may then be allowed to proceed, under control, to the advance signal. The clearing of a home signal, in any case, gives authority to proceed to the advance signal only. To avoid the necessity of placing the home signal at «clear» for a train that is to be held at the advance signal, an auxiliary signal may be used. This is known as a «calling on» signal, and is a short semaphore blade fixed upon the home signal post below the home signal blade. When in the «safety» position this signal gives a train authority to pass the home signal at «danger» and proceed under control to the advance signal.

Automatic Blocking.— Automatic block signals are operated through the agency of electricity or of a combination of electricity and compressed air, by the passage of trains into and out of the block. A track circuit is generally used in automatic blocking, for conveying the electric current to the signals. In arranging a track circuit, a gravity battery is commonly used, and is placed at the advance end of the block. A relay and the signal are placed at the other end. Each line of rails is connected with a pole of the battery. The current passes along the rails of one side of the track, through the relay, thence along the rails of the other side of the track, thus forming a circuit. The relay controls a local circuit which works an electro-magnet, which in the simple electric system actuates the signal, and in the electro-pneumatic system permits compressed air to actuate it. The electric power may be generated by a dynamo. The use of storage batteries in electro-pneumatic interlocking permits of a closer regularity of the quantity and pressure of the current, and results in considerable economy in operation.

Automatic block signals are operated under two plans: (1) the *normal-safety* plan, that in which the signals always show «clear» unless the block is obstructed either by a train or otherwise; (2) the *normal-danger* plan, that in which the signals are at «danger» at all times except when cleared by an approaching train, which can be done only when the block is clear of trains and other obstructions.

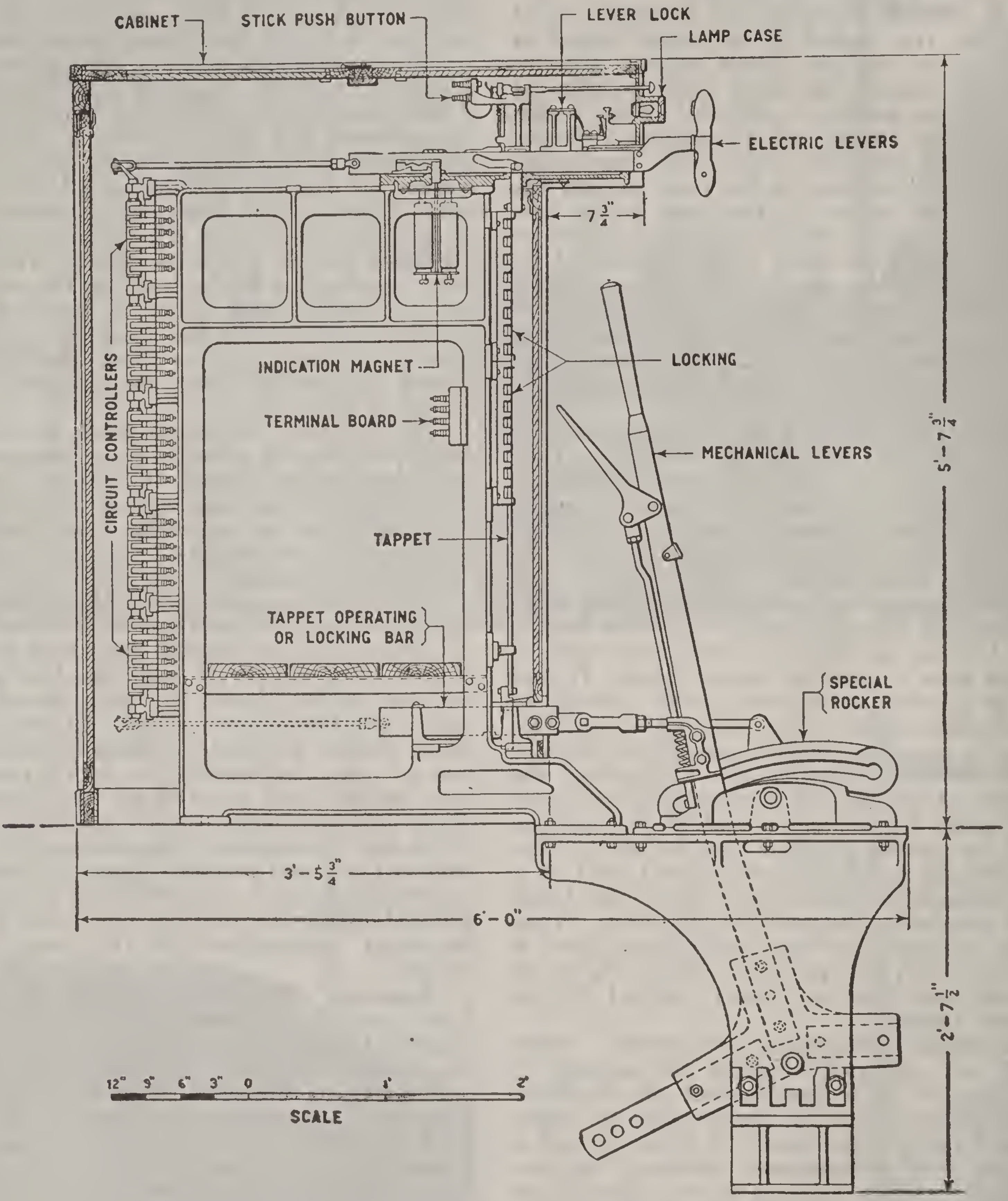
Automatic block signals are applicable to junctions, railroad crossings and drawbridges if manual interlocking is used. Separate signals are provided for the interlocking. The same rules apply to the block signals here as elsewhere. If the interlocking and block signals both show «clear;» trains may proceed with speed. At a junction, where the route diverges, the block signals will show «clear» when there is no train in the block ahead on the main line, and the interlocking signal is lowered for a train to continue on the main line, or when there is no train in the block ahead on the branch line and the interlocking signal for the branch is lowered.

The ordinary automatic block system provides protection for following movements, but for opposing movements it fails to meet the requirements of an ideal system for the reason that the block for opposing movements does not extend from siding to siding, an inherent defect in the system.

In the absolute permissive block system the block for opposing movements is from siding to siding and the signals governing entrance to this block are in all cases absolute or stop-and-stay signals, hence the term «absolute» in the name of the system. For following movements the block between sidings is divided into two or more sub-blocks, as traffic conditions may require, and movements into these sub-blocks are governed by intermediate signals which may be absolute (stop-and-stay), or permissive (stop-and-proceed) signals. Ordinarily, intermediate signals are permissive or stop-and-proceed signals as used on double track, hence the term «permissive» in the name of the system.

Absolute Permissive Block System.— This system of automatic block signals is adapted to meet the exacting requirements of single-track signaling. On double track, train movements on the same track are in the same direction. The fundamental requisite of double-track signaling is to so arrange the signals as to provide a space interval between trains corresponding to a given time interval. For example, if the maximum traffic consists of trains operated at one-minute intervals and at a speed of 60 miles per hour, there would be a space interval between trains of one mile (less the train length). This space interval is divided into block sections so arranged as to permit trains to follow each other under adequate signal protection.

On single track, train movements are in *both* directions. The fundamental requisites are two, one for following movements as in double track and the other for opposing movements. To accommodate following train movements, the block sections are arranged to permit trains to follow as in double-track signaling. For opposing train movements the block sections must be arranged to prevent the display of signal indications that would permit opposing trains to enter the same block section at the same time. These block sections should extend from one passing siding to the next. This, however, is not a feature of the ordinary type of automatic signaling, but is one of the important features of the absolute permissive block system. Another requisite is that a reliable caution indication be displayed for each stop indication. This is a vital point at passing sidings where opposing trains approaching each other must have ample warning of a signal in the stop position.



Sectional view Electro Mechanical Interlocking Machine

The system is flexible and can be easily arranged to provide for the special requirements of any railroad. The chief advantages of the system are: (1) Opposing train movements are governed by absolute signals, the block extending from siding to siding; (2) following train movements are governed by permissive signals, the block extending from signal to signal; (3) at meeting and passing points maximum signal protection provides an efficient check against failure to observe meeting and passing points; (4) flagging is reduced to a minimum, as following trains operate as in double track; (5) a reliable caution signal indication is displayed for every stop indication; (6) the minimum distance is reduced 30 per cent between following trains running under clear signals as compared with the ordinary system; (7) due to the protection against opposing trains «tonnage» signals, so called, may be used to eliminate the stoppage of tonnage trains on ascending grades where it would be difficult to start them; (8) signals are restored to normal position as soon as the block section is clear, regardless of any sequence of movements; (9) minimum number of signal appliances and line wires required.

Interlocking Signals.— Movements in the reverse direction of traffic (or «backing-up» movements) are sometimes necessary and these must be guarded by separate signals provided for the purpose. The apparatus used at railroad crossings and junctions to ensure the proper display of the switch signals when the switches are changed from one position to another — that is, set for a different route — and to operate the switches and signals from a central point is known as an interlocking machine. The fundamental principle of the design of the interlocking machine is that when the switches and signals are set for any one route no switch or signal can be set for any conflicting route, or a route which would foul the route already «cleared.» In this way collisions at junctions and switches are effectually prevented. The interlocking signals are not a part of the block system proper, but, as already stated, they should be arranged to work in connection therewith. The necessity of having the switches and signals co-operate in order to prevent such accidents as are apt to occur from the independent working of the switches from several points was early experienced by the railroads, switches being frequently set for one move and signals for another, causing innumerable accidents.

Railroad Crossings and Junctions.— The foundation principle of absolute blocking at crossings and junctions is that all the blocks intersecting at a junction or crossing frog shall be operated as one block. All junctions and crossings should be provided with block signals, interlocked switch signals and derail switches. The latter are opened when the signals with which they are connected are set at «danger,» so that a train running past a signal at «danger» will be turned off the track before it can meet a train on another track at the fouling point. Where the track is lower, the derail switch should be placed not less than 500 feet from the fouling point. On a grade descending toward the junction or crossing, the derail should be placed far enough away to give the same degree of safety that it would on a level track at a distance of 500 feet. The block signals, switches and switch signals should be so interlocked that a clear-block signal cannot be given when there is an intervening switch set for a different movement.

Each track must have its own block signals. Where trains proceed in the same direction on different tracks, the signals relating to these tracks are generally placed on the same post or on a bridge spanning the tracks. In the former case the post supports a cantilever bracket carrying short posts upon which are mounted the signals, the post carrying the main-track signal being higher than the others and nearest the main track. An arrangement of signals for trains in the same direction on different tracks that is simpler is to have the signal governing the main-track movement on a high post by itself and all others on low posts. As all movements from and on side tracks are made at comparatively slow speed, the position of low signals may be readily observed by those interested.

Outdoor Signals.— The physical means by which signals are displayed in the block system are of several types, the most common being the semaphore. This is a flat blade or vane of wood or metal, 4 or 5 feet long and 10 to 12 inches wide. One end of this blade is supported by a pivot on the signal post, and thus the blade is free to be swung into different positions. In some systems two positions are arranged for, the horizontal and the inclined — either upward or downward. In other systems the blade may be set at three positions — horizontal, inclined and vertical — the two latter either upward or downward. These positions are visible only in the daytime, and, for nights, light are displayed automatically, which, by their differing colors, indicate the position of the semaphore blade. This is accomplished by a curved spectacle-like extension at the pivot end of the blade holding two (or three) «roundels» or discs of colored glass before a lamp on the signal post, corresponding to the two (or three) possible positions of the semaphore.

In all systems in which the semaphore is employed, a horizontal position means that the block is occupied by a train and is equivalent to the order, «stop.» The roundel which in that position covers the lamp is red. In the two-position semaphore, the «block clear» signal is made by dropping the outer end of the blade to an angle of about 70 degrees below the horizontal. The roundel which corresponds to this position is, in most cases, white; but the larger railroads are, one by one, changing all «white» or «proceed» signals to green. In the three-position semaphore the horizontal position of the blade means «stop.» When the blade is dropped to an angle of 45 degrees, or, in some systems, raised to an angle of 45 degrees, the signal means «proceed with caution,» and its equivalent light at night is generally green, though by the new color plan it is a brownish-yellow. In the third position the blade is vertical — either upward or downward — signifying «block clear» or «proceed»; and in the older scheme the light at night is white and by the new color plan it is green. The doing away of the white light makes for a larger degree of safety, for it was not an unusual accident that the roundel should be broken and the light show white when it should have been red. Under the new color plan a white light will mean a broken roundel and hence «danger,» and will require a stop and examination as to the position of the semaphore blade.

In the more highly organized signal systems two sets of signals are used, the «home» signal and the «distant» signal; the former name relating to the signal at the entrance to the block, the latter to a signal which indicates the position of the signal at the entrance to the next block. Both are usually on the same post. As a means of distinguishing them, the outer end of the semaphore blade is deeply notched, like a fish tail. It is generally set lower on the signal post. Or, in some systems the «distant» signal is shorter and narrower. The «distant» signal has only two positions — horizontal, meaning «caution» (when approaching entrance to the next block), and inclined, meaning that the next block also is clear. The colors of the lights displayed at night correspond to the «caution» and «clear» colors used on the system. The «distant» signal, therefore, is only a preliminary indication of the signal at the next block and is merely designed to facilitate the operation of a fast train service.

Another signal system which has a large vogue uses the «disc» or «banjo» device instead of the semaphore. The disc revolves on a pivot, so as to show the full face when at danger and only the edge of the disc when the block is clear. A lantern mounted on top of the disc carries two roundels of different colors, showing red when the disc presents a full face and white (or green) when the edge indicates a clear block. A modification of the disc system is arranged so that the disc always presents a full face, with an opening in the centre. Across this opening are thrown colored roundels, red, green or yellow, as the case may be. This system is the one in use on nearly all subway and tunnel traffic and on many electric roads. On the last mentioned the Hall Automatic system, an electric block system, is in extensive use. The instrument which displays the signals is contained in a case mounted on an iron or wooden post, the length of which may be varied to suit conditions. Within the case is mounted a disc of red silk, with a red glass on the opposite end of the arm carrying the disc. By day a white glass in the back of the home signal case is exposed through the glass-covered aperture in front so long as the large red disc is held out of sight. The front of the case being dark, the indication of safety is thus shown by a white disc in the centre of a dark ground. The falling of the large disc before the glass produces the danger signal, by showing red, and at the same time cuts off the strong contrast formed by the pure white light disc in the centre of the dark case. The front opening is larger than the disc proper, so that when the signal is at «danger» there is a band of white shown around the disc. At night the clear signal is obtained direct from a lamp, showing a white light through the small opening in the top of the case. On the signal assuming the danger position, a ruby-glass lens is carried up before the small opening by gravity, giving a red light. When desired, the «clear» night indication may be green instead of white. In this case the single glass disc is replaced by a double disc, one green, the other red, these being placed at right angles to each other. The distant signal is substantially of the same construction, but the disc is green, and the face of the case may be painted white, to distinguish this signal from the home signal. When at danger the green disc presents a strong contrast to the white surrounding case. At night a green (or orange) lens is used to indicate «caution.» At junctions, cross-overs, sidings, etc., a switch instrument is used, which, through its electrical connections, causes the block signal to display «danger» when a switch is not set for the required movement. A visible indicator is placed at main-track switches to warn a trainman desiring to open a switch to let a train out on the main line. This indicator will show «danger» if an approaching train shall have passed a point 1,000 feet or more in advance of the home signal next back of the switch. If the main track is clear and the trainman therefore opens the switch, this operation sets at «danger» the main-track home signal of the block in which the switch is situated.

Besides the three colors mentioned, it is customary to mark the entrance to a curve in a subway or tunnel with a blue light, so that the running speed may be reduced to prevent undue wear of the rails.

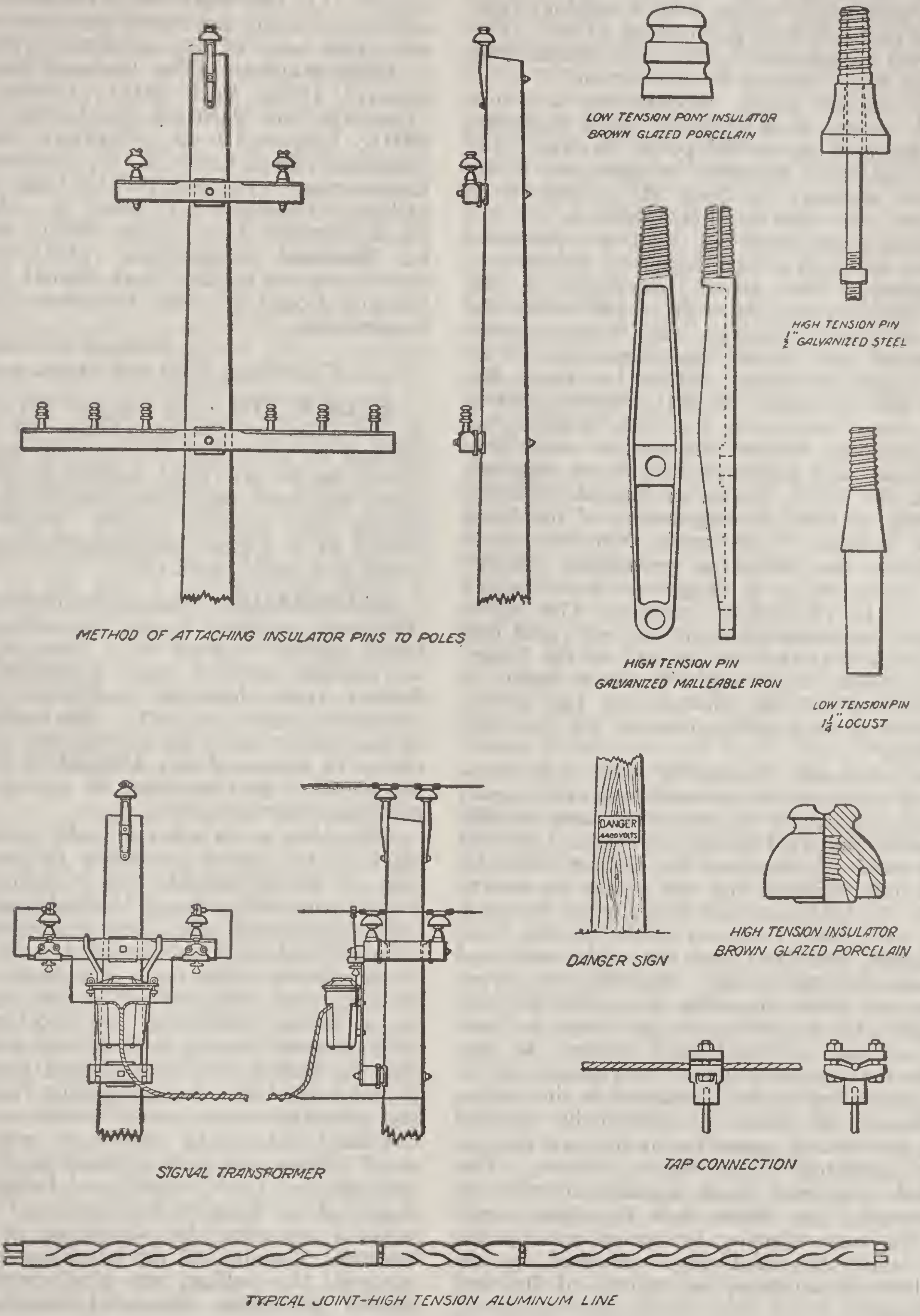
In locating the home signal on single-track lines, care must be taken that the blocks do not overlap. In other words, the home signal governing the entrance to a block for trains running in one direction must be so placed that a train can go to it without encroaching on the block for trains running in the opposite direction. This should be the arrangement of the home signals at every single-track block station, whether there is a passing siding there or not. The rule that a train leaving a block station has the right to proceed quite up to the home signal of the block station in advance should always govern in the locating of home signals. Or, as a general proposition, it may be said of home signals for single-track blocking, that they must be so located that two trains moving in opposite directions toward a common point can be stopped at that point clear of each other, by those signals. Machine blocking undoubtedly offers the safest method of single-track blocking, and is in considerable use on electric roads. The principle involved is a modification of the English staff system. Staff or tablet machines are used, one being placed at each end of each block, and these machines are so constructed that the withdrawal of a staff or tablet from one machine automatically locks the apparatus so that a second staff or tablet cannot be obtained at either end of the block until the first one is restored to one or other of the two machines of the block. The advantages of the electric train staff are (1) that a train can be sent forward from either end of the section without awaiting the arrival of the staff from the other end, a frequent source of delay under the old method, and (2) that greater security in working is obtained on account of the impossibility of withdrawing a staff from the machine at either end of the section without the concurrence of the signalman at the other end. A machine is placed at each end of the block, the two machines being connected by an electric circuit.

The rapid development of railway traffic has created a demand for the power signal in block signaling and interlocking. The power signal has also been developed to meet the increasing requirements and is an important factor in the safe and economical operation of railway trains. In blocking or spacing trains, the power signal in connection with a track circuit automatically indicates the presence of a train in the block, a misplaced switch or a broken rail; in routing or switching trains, in connection with electric interlocking, the power signal under control of a leverman, and track circuit also when desired, may be located at any distance from the interlocking tower so that the limits of the interlocking plant are unrestricted; and as a distant signal, in connection with a mechanical interlocking plant, the power signal may be located at a sufficient distance from the home signal to afford proper braking distance for high speed trains.

Since the invention of the closed-track circuit in 1872, the power signal has passed through successive stages of development:

from the clockwork disc to the electro-pneumatic semaphore; from the electro-pneumatic semaphore to the enclosed disc; from the enclosed disc to the electro-gas semaphore; and finally to the highly perfected electric motor semaphore.

The general features of the electro-pneumatic system are (1) a rail circuit with its batteries and relays; (2) an air compressor with its pipes to the signal posts; (3) the signal posts themselves with their arms, air cylinders and electrically-controlled valves. Two semaphore signals are placed on a post about 50 feet to the rear of each section. The upper one, according to the general practice, is the «danger» or home signal, is painted red and governs the section immediately ahead; the lower one is the «caution» signal, is painted green (or yellow) and works in harmony with the «danger» signal of the next section. Each semaphore is operated by a cylinder three inches in diameter, fitted with a piston, the rod of which is so connected as to move the signal to its «clear» position when air pressure from the main pipe line is applied to the piston, by means of the electric valves, that being the position of the signals when the track is clear for the movement of trains. Each



Construction Details — Transmission Line signal blade carries an appropriately colored lens, which covers a light when the blade is in the horizontal position, showing red if it is the upper signal, and green (or yellow) if it is the lower signal. A white (or green) light is exposed when the signal is in position to indicate that the track is clear.

The electro-gas apparatus is similar to the electro-pneumatic, except that it employs compressed carbonic acid gas instead of air. This gas when compressed is far more elastic than air, and works with a livelier action.

The electric motor mechanisms are considered by the most advanced signal engineers to be the best all around power devices. The one considerable difficulty in their use is the absolute necessity to keep them free from moisture. In spite of this drawback, not yet overcome, many miles of road are protected by them and with a high degree of satisfaction.

History.— The actual operation of the block signal system dates from 1839 when the Great Western Railway, of England, first telegraphed the arrival and departure of its trains from station to station for short distances near London. In 1841, separate instruments were introduced for each direction of traffic, showing whether the sections were clear or blocked, and telegraph bells were installed. In 1842, Sir W. F. Cooke, an English engineer, published a series of suggestions of the block system entitled 'Telegraphic Railways' and laid down the following principles: «Every point of a line is a dangerous point, which ought to be covered by signals. The whole distance, consequently, ought to be divided into sections, and at the end as well as the beginning of them, there ought to be a signal, by means of which the entrance to the section is opened to each train when we are sure that it is free.»

The constantly increasing volume of business on railroads necessitated improved means for securing safety in operation, and in 1851 the South Eastern Railway of England devised the method of signaling by electric bells, by sound only, without the use of needle instruments. In 1854, separate instruments for each track, with three positions of the needle, were introduced, and later the bell code was used in connection therewith. In 1875, the Sykes system of block signaling was invented and brought into extensive use, not only in England but also in the United States. In this system the outdoor signals at a block station were controlled by the signalman at the station in advance, by means of electrically-operated locks, the locking apparatus at the two stations being connected by an electric circuit. This effected a decided check against mistakes or carelessness, for while each signalman operated his own signals, he could not operate them until they had been unlocked by the signalman in advance, on request of the first signalman.

The advance has been continually toward the point of reducing the human element in signaling to a minimum, the ultimate goal being the strictly automatic operation of all running signals. The selection by a railroad of any particular type of signal system depends primarily upon its cost to install. The automatic is the most expensive to set up, but the least expensive to operate, and the trend is constantly toward expenditures which actually insure the road against heavy losses through accidents.

Out of the 220,801 miles of railroad track on which passenger trains were being operated in the United States on 1 Jan. 1916, 124,447 miles were protected by some form of block signals. Of this total, on 51,120 miles the signals were of the automatic type, and on 73,327 miles they were of non-automatic types.

Bibliography.— 'The Railroad Signal Dictionary' (New York 1911); Elliott, W. H., 'The ABC of Railroad Signalling' (Chicago 1909); Latimer, J. B., 'Railway Signalling' (Chicago 1908); Lewis, L. P., 'Railway Signal Engineering' (London 1912); Pigg, J., 'Signalling' (London n.d.); Scott, R., 'Automatic Block Signals' (New York 1908); Webb, W. L., 'Railroad Construction' (1913); and the annual reports of the Block Signal and Train Control Board of the Interstate Commerce Commission.

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BLOCK TIN. An inferior variety of tin in the form of blocks. When the metal is reduced in a furnace it is poured into molds. These ingots are later heated to the fusion point, the pure tin fusing first is drawn off, leaving the inferior quality which is now melted at a higher temperature, poured into molds and called block tin.

BLOCKADE. The term blockade, properly used, involves a state of war. The so-called pacific blockade is a form of reprisal or restraint short of war. A blockade is also distinct from domestic prohibition of intercourse or closure of ports. Blockade does not necessarily in later days have any relation to siege. In a general way, blockade is an attempt to cut off a port or coast of an enemy from maritime communication.

The idea as to what actually constitutes a blockade has varied according to the relationship of the belligerents and in different wars. Prior to the 16th century blockades were sometimes proclaimed when one belligerent wished to apprehend commerce bound for certain ports of the other belligerent. Gradually the idea became more clear owing to the development of maritime commerce. A proclamation of 1630 mentions that it is in accord with ancient custom that neutral vessels and cargoes may be confiscated if going to, coming from or sailing near the enemy ports «which are continually held blocked by vessels of war at great cost.» There were many departures from the principle set forth in 1630 and belligerents endeavored to obtain the advantages of a blockade without assuming the obligations of its maintenance. Usually, till the latter part of the 18th century, the belligerents proclaimed and enforced blockades somewhat arbitrarily, even going so far as to interdict any commerce with an enemy.

The action of the northern states of Europe in the armed neutrality of 1780, which was later approved by France, Spain and Austria, served to modify the extreme claims of belligerents which had been developing. Article IV of the declaration of the armed neutrality stated "that in order to determine what characterized a blockaded port, that name should be accorded only to a port where by act of the power making the attack vessels anchored sufficiently near should make it dangerous to enter." In 1800 Russia and Sweden agreed that a notification to the neutral vessel by the blockading force was necessary in order to render the neutral vessel liable to penalty.

The recognition of neutral rights secured by the armed neutralities of 1780 and 1800 was not continued in the early years of the 19th century, when by decrees and orders in council Napoleon and Great Britain tried to destroy all commerce. During the first half of the 19th century there was a tendency to extend the belligerent interference with commerce at the expense of neutrals. At times areas of great extent were declared blockaded and no considerable force was sent to maintain the blockade. In one case in 1816 the penalty of death by hanging at the yard-arm was mentioned for the master or other principal officers of a vessel entering prohibited area. Against the extreme extension of the area of blockade President Monroe in 1816 protested, and in following years other American Presidents protested, in general endeavoring to secure large liberty for neutrals. Proclamations were issued by belligerents making the presence of military officers and merchants of the enemy on board, or presence within six miles of the coast with contraband on board evidence of intention on the part of a vessel to violate a blockade. In 1825 Brazil proposed to require bonds from neutral vessels that they would not violate blockade. The United States replied that "A blockade must execute itself." Attempts were made to establish blockades which would allow ships of certain nationalities to pass while closing the ports to others and to continue a blockade for two months after the treaty of peace. While there were such great variations in proclamations, the differences in application of the principles were even greater.

There seems, therefore, as regards blockade, ample reason for the statement in the Declaration of Paris of 1856, signed by Austria, France, Great Britain, Prussia, Russia, Sardinia and Turkey, "That maritime law in time of war has long been the subject of deplorable disputes." It was the aim of this declaration to establish a "uniform doctrine" on certain points, among these, blockade. Accordingly the fourth article of the Declaration provides: "Blockades, in order to be binding, must be effective — that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy."

The United States, China, Mexico and Spain did not become parties to this declaration. Questions soon arose in regard to the interpretation of this clause which it had been hoped would end many of the "deplorable disputes." Apparently to make the clause more clear the British Admiralty Manual added "or, at any rate, to create evident danger to ships attempting ingress or egress."

The Civil War in the United States put some of the doctrines in regard to blockade to the test. The French had generally maintained that liability for violation of blockade was conditioned upon notification of the blockade to a vessel approaching the line by a vessel of the blockading force. Great Britain and the United States had contended that a general public notification was sufficient. These ideas were therefore in conflict. Questions were raised as to the effectiveness of a blockade which depended upon the co-operation of shore batteries or upon the closing of certain navigable channels by the sinking of vessels, stones or other obstructions. The extent of coast line which might be blockaded effectively by such forces as the Northern States had at their disposal was in doubt. Great Britain in the case of the *Helen* in 1865 stated the British and American point of view at that time, saying, "There are several conditions to be observed in order to justify the seizure of a ship for breach of blockade. The blockade must be effectual and (save accidental interruption by weather) constantly enforced. The neutral vessel must be taken *in delicto*. The blockade must be enforced against all nations alike, including the belligerent one. When all the necessary conditions are satisfied, then, by the usage of nations, the belligerent is allowed to capture and condemn neutral vessels without remonstrance from the neutral state." (1865, L. R. 1 A. & E. 1).

Certain principles became more definite through the decisions in consequence of the Spanish-American War of 1898. As to the number of vessels necessary, the Supreme Court of the United States said, "As we hold that an effective blockade is a blockade so effective as to make it dangerous in fact for vessels to attempt to enter the blockaded port, it follows that the question of effectiveness is not controlled by the number of the blockading force. In other words, the position cannot be maintained that one modern cruiser though sufficient in fact is not sufficient in law." (*The Olinde Rodriguez*, 174 U. S. 510). It was also stated that a captured vessel was not in condition to dispute the effectiveness of the force which captured her, and further it was thought "a sufficient compliance with the obligations of international law if the blockade made egress or ingress dangerous in fact." In the Russo-Japanese War, 1904–05, the Japanese regulations provided that:

"Blockade is to close an enemy's port, bay or coast with force, and is effective when the force is strong enough to threaten any vessels that attempt to go in or out of the blockaded port or bay or to approach the coast."

The duration of liability to capture had been subject to difference of opinion. Continental opinion has inclined to the side of liability only when taken in the act or when continuously pursued. British and American opinion has made liability to begin upon departure on the voyage and to terminate with its completion when the intent to violate a blockade is present, and if a vessel has escaped from a blockaded port the liability to capture continues until the vessel reaches her home port. An attempt was made by the International Naval Conference of 1908–09 to reconcile in the Declaration of London these and many other differences of opinion upon details of instituting and maintaining a blockade. This naval conference represented the United States, Germany, Austria, Spain, France, Great Britain, Italy, Japan, Netherlands and Russia, the powers especially concerned with the conduct of naval warfare. The conclusions were declared «to correspond in substance to the generally recognized principles of international law.» The articles relating to blockade in the Declaration of London numbered 21 and embody what up to August 1914, when war broke out in Europe, was regarded as a satisfactory statement of the law of blockade. These articles are as follows:

«Article 1. A blockade must be limited to the ports and coasts belonging to or occupied by the enemy.

Art 2. In accordance with the Declaration of Paris of 1856, a blockade, in order to be binding, must be effective — that is to say, it must be maintained by a force sufficient really to prevent access to the enemy coast.

Art. 3. The question whether a blockade is effective is a question of fact.

Art. 4. A blockade is not regarded as raised if the blockading forces are temporarily driven off by bad weather.

Art. 5. A blockade must be applied impartially to the ships of all nations.

Art. 6. The commander of a blockading force may grant to a warship permission to enter, and subsequently to leave, a blockaded port.

Art. 7. In circumstances of distress, acknowledged by an authority of the blockading forces, a neutral vessel may enter a place under blockade and subsequently leave it, provided that she has neither discharged nor shipped any cargo there.

Art. 8. A blockade, in order to be binding, must be declared in accordance with article 9, and notified in accordance with articles 11 and 16.

Art. 9. A declaration of blockade is made either by the blockading power or by the naval authorities acting in its name.

It specifies —

(1) The date when the blockade begins;
(2) The geographical limits of the coast blockaded;
(3) The delay to be allowed to neutral vessels for departure.

Art. 10. If the blockading power, or the naval authorities acting in its name, do not establish the blockade in conformity with the provisions which, in accordance with article 9 (1) and (2), must be inserted in the declaration of blockade, the declaration is void, and a new declaration is necessary in order to make the blockade operative.

Art. 11. A declaration of blockade is notified —

(1) To the neutral powers, by the blockading power by means of a communication addressed to the governments themselves, or to their representatives accredited to it.

(2) To the local authorities, by the officer commanding the blockading force. These authorities will, on their part, inform, as soon as possible, the foreign consuls who exercise their functions in the port or on the coast blockaded.

Art. 12. The rules relative to the declaration and to the notification of blockade are applicable in the case in which the blockade may have been extended or may have been re-established after having been raised.

Art. 13. The voluntary raising of a blockade, as also any limitation which may be introduced, must be notified in the manner prescribed by article 11.

Art. 14. The liability of a neutral vessel to capture for breach of blockade is contingent on her knowledge, actual or presumptive, of the blockade.

Art. 15. Failing proof to the contrary, knowledge of the blockade is presumed if the vessel left a neutral port subsequently to the notification of the blockade made in sufficient time to the power to which such port belongs.

Art. 16. If a vessel which approaches a blockaded port does not know or cannot be presumed to know of the blockade, the notification must be made to the vessel itself by an officer of one of the ships of the blockading force. This notification must be entered in the vessel's log book, with entry of the day and hour, as also of the geographical position of the vessel at the time.

A neutral vessel which leaves a blockaded port must be allowed to pass free if, through the negligence of the officer commanding the blockading force, no declaration of blockade has been sent to the local authorities, or if, in the declaration as notified, no delay has been indicated.

Art. 17. The seizure of neutral vessels for violation of blockade may be made only within the radius of action of the ships of war assigned to maintain an effective blockade.

Art. 18. The blockading forces must not bar access to the ports or to the coasts of neutrals.

Art. 19. Whatever may be the ulterior destination of the vessel or of her cargo, the evidence of violation of blockade is not sufficiently conclusive to authorize the seizure of the vessel if she is at the time bound toward an unblockaded port.

Art. 20. A vessel which in violation of blockade has left a blockaded port or has attempted to enter the port is liable to capture so long as she is pursued by a ship of the blockading force. If the pursuit is abandoned, or if the blockade is raised, her capture can no longer be effected.

Art. 21. A vessel found guilty of violation of blockade is liable to condemnation. The cargo is also liable to condemnation, unless it is proved that at the time the goods were shipped the shipper neither knew nor could have known of the intention to violate the blockade.»

At the outbreak of the European War in 1914 the above articles were practically contained in the regulations of the belligerents, and certain blockades were proclaimed and maintained in accord with these articles. One of the earliest of these proclamations was issued by Great Britain on 23 Feb. 1915, declaring the coast of German East Africa between certain points under blockade from midnight 28 February–1 March and allowing four days of grace for departure of neutral vessels from the blockaded area. Similar proclamations were issued for the Cameroons on 24 April 1915, and for the coast of Asia Minor on 1 June 1915.

The British and French proposed, in a note of 1 March 1915, in retaliation for the war zone proclamation of Germany, to take measures "to prevent commodities of any kind from reaching or leaving Germany." Under these measures, it was said, "The British and French governments will therefore hold themselves free to detain and take into port ships carrying goods of presumed enemy destination, ownership or origin. It is not intended to confiscate such vessels or cargoes unless they would otherwise be liable to confiscation." Of this proposition the United States government, in a note of 5 March 1915, said: "The first sentence claims a right pertaining only to a state of blockade. The last sentence proposes a treatment of ships and cargoes as if no blockade existed. The two together present a proposed course of action previously unknown to international law." Other correspondence followed upon this so-called blockade measure. The United States, in a long note of 21 Oct. 1915, asserted that "It is incumbent upon the United States government, therefore, to give the British government notice that the blockade which they claim to have instituted under the Order in Council of 11 March cannot be recognized as a legal blockade by the United States." The reasons given were that the British measures did not constitute "a blockade in law, in practice or in effect." Referring to the American contention that the British blockade of Germany was not effective because German ports were open to Scandinavian trade, the British note of 24 April 1916 advances the proposition that "even if these measures were judged with strict reference to the rules applicable to blockades, a standard by which, in their view, the measures of the Allies ought not to be judged, it must be remembered that the passage of commerce to a blockaded area across a land frontier or across an inland sea has never been held to interfere with the effectiveness of the blockade." In the preceding paragraph, the same note says, "that the rules applicable to a blockade of enemy ports are strictly followed by the Allies in cases where they apply, as, for instance, in the blockades which have been declared of the Turkish coast of Asia Minor, or the coast-line of German East Africa." In the practice in regard to continental Germany there is therefore admittedly a claim to extension of rights which at the outbreak of the war were not regarded as belonging to belligerents engaging in blockading operations. Of this Prof. Sir Erle Richards has said "It is certain that the rights with regard to blockade must be extended if the right is to continue." The United States has, however, in objecting to innovations in practice during war said, "It is of the highest importance to neutrals, not only of the present day but of the future, that the principles of international right be maintained unimpaired." See ARMED NEUTRALITY; DECLARATION OF LONDON; INTERNATIONAL LAW; MERCHANT VESSELS, NEUTRAL, RIGHTS OF; NEUTRALITY; WAR, EUROPEAN.

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BLOCKHOUSE, in fortification, a house made of beams joined together crosswise, and often double, with a covering and loopholes, large enough for from 25 to 100 men. In addition to this, it is commonly covered with earth, to render it entirely bomb- and fireproof. Forts of this kind are often fitted up to receive cannon. Blockhouses are generally built in the form of a square or a cross. Their use is to afford a feeble garrison of an important place, which is very much exposed, an opportunity of holding out against the cannonade and assault of the enemy till they are relieved. They also serve for bomb-proof guardhouses and places of last resort, in the interior of intrenchments and in the covered passages of fortresses, where the cannon are stationed. Blockhouses were much employed as a defense against Indians in America, by the French in Algeria and by the Spanish in Cuba, where a line of blockhouses connected by wire barricades was built across the island in 1898. See FORTIFICATION.

BLOCKS OF FIVE, a political expression in the United States, originating in the presidential campaign of 1888. A letter purporting to have been written by the treasurer of the Republican National Committee to the chairman of the Indiana State Committee, recommending securing "floaters in blocks of five." This was construed to mean the bribery of voters at wholesale rates. The Democratic managers circulated the letter as widely as possible, before election. Proceedings for libel were afterward begun, but never brought to trial.

BLOCKSBERG, the name of several elevations in Germany, particularly the Brocken, forming the summit of the Hartz Mountains and the highest point in the northern part of the empire. In old legends the Brocken is the haunt of the witches, who there celebrated with orgies the first of May, *Walpurgisnacht.* See WALPURGA.

BLODGET, Lorin, American statistician: b. near Jamestown, N. Y., 25 May 1823; d. Philadelphia, 24 March 1901. He was educated at Hobart College; appointed assistant professor at the Smithsonian Institution, Washington, D. C., in charge of researches on climatology, 1851; was employed on the Pacific Railroad survey for the War Department, 1852–56; and was engaged in the United States Treasury Department, 1863–77. He was also editor of the Philadelphia *North American,* and secretary of the board of trade of that city, 1858–64. He is credited with having laid the foundation of American climatology. His publications include 'The Climatology of the United States' (1857), a work that met high favor in the United States and Europe; 'Commercial and Financial Resources of the United States'; and about 150 volumes of reports on finance, industrial progress and kindred subjects.

BLODGETT, Henry Williams, American jurist: b. Amherst, Mass., 21 July 1821; d. Waukegan, Ill., 9 Feb. 1905. He was educated at Amherst Academy; studied surveying and engineering; was admitted to the bar in 1844; and settled in Waukegan, Ill., to practice, in the following year. He served in the lower house of the legislature, 1852–54, and in the State senate, 1859–65; and was United States district judge for the Northern District of Illinois, 1869–93, when he retired. He was appointed one of the counsel on the part of the United States before the arbitration tribunal on the Bering Sea fur-seal controversy between the United States and Great Britain, in 1892.

BLODGETT, Samuel, American inventor: b. Woburn, Mass., 1 April 1724; d. Haverhill, Mass., 1 Sept. 1807. He took part in the French and Indian War; was a member of the expedition against Louisburg in 1745; and subsequently became a judge of the Court of Common Pleas in Hillsboro County, N. H. He was the inventor of an apparatus by which he recovered a valuable cargo from a sunken ship near Plymouth, Mass., in 1783. His success led him to go to Europe for similar enterprises. He met with no encouragement in Spain, and in England proposed to raise the *Royal George,* which went down off Spithead with 800 persons on board, but his proposition was not accepted. In 1793 he began the construction of the canal around Amoskeag Falls in the Merrimac, but did not live to complete the work.

BLOEMAERT, bloo'märt, or **BLOM, Abraham,** Dutch painter: b. Gorkum, 25 Dec. 1564; d. Utrecht, 27 Jan. 1647, or more probably 1657. He came to Paris about 1580 and there studied under Herry, Bassot and Franck. After spending some time in Amsterdam, where his father had become city architect, he settled at Utrecht in 1595. After 1600 he was prominent in Saint Luke's Guild of that city. Up to an advanced age he continued to teach painting, to paint and to engrave. His paintings are reproached with various faults, yet he is distinguished by the brilliancy of his coloring and the richness of his invention. He painted all sorts of objects, but his landscapes are the most esteemed. Consult Van Mander, 'Le Livre des peintres' (1885). He had four sons, of whom CORNELIUS (b. Utrecht 1603; d. Rome 1680), was a distinguished engraver.

BLOEMEN, Jan Frans van, Flemish painter: b. Antwerp, 12 May 1662; d. Rome 1748. At first he studied under Gouban, was attracted to Italy and there came under the influence of Claude Lorrain and Dughet. He was surnamed «Orizzonte,» an allusion to the great beauty of the coloring he put into his landscapes.

BLOEMEN, Pieter van, Flemish painter, brother of Jan Frans: b. Antwerp 1651; d. 1720. He was made apprentice in 1667; becoming master in 1674, he set out for Rome where he remained for 20 years and where he received the surname of «Standaart.» Returning to his native city he was appointed dean of the Guild of Saint Luke there. His work is chiefly landscapes and military subjects.

BLOEMFONTEIN, bloom'fŏn-tīn, Orange River Colony, South Africa, the chief town and seat of government of the colony, 680 miles northeast of Cape Town, situated in an elevated and healthy region. It stands on a plain surrounded by low hills, and is regularly laid out, having a large market-square in the centre. It has several fine buildings, including the Anglican cathedral, the Dutch Reformed church and other places of worship; the presidency; the town-hall; the post office; the library; the national museum; the new Raadzaal, or council-chamber of the legislature; the old Raadzaal; Grey College and Saint Andrew's College for boys; the Eunice Institute for girls; a government hospital and a cottage hospital; a lunatic asylum, etc. It is on the main railway line of the Colony, which is continuous with the Cape Colony and Transvaal systems. In the war between Great Britain and the South African and Orange Free State republics in 1899–1902 it was the seat of important military operations. In June 1899, a conference was held here between President Kruger of the South African republic and Sir Alfred Milner, the British Commissioner of Cape Colony, with a view of averting war. After the appointment of Lord Roberts to the supreme command of the British forces operating against the Boers, he led an expedition against the city and forced its surrender on 13 March 1900. Soon afterward the republic was formally placed under British administration, and it is now a part of the Union of South Africa. It is a centre of trade which consists mainly of wool. The industries include manufactories of aërated waters, salt, flour mills and breweries. Pop. about 15,000, half being whites.

BLOIS, blwä (anciently BLESUM), France, the capital of the department of Loir-et-Cher, 99 miles south-southwest of Paris, situated on the right bank of the Loire, from which it rises in the form of an amphitheatre. It consists of an upper town, with very narrow and crooked streets; a lower town, with many handsome houses, extending along a handsome quay; and of several suburbs, with one of which it communicates by a stone bridge of 11 arches. The city is furnished with spring water through an old Roman aqueduct, in excellent preservation. Thierry, the historian, was born here. The castle of Blois is rich in historical associations. It was long occupied by the counts of the name, and became a favorite residence of the kings of France. Louis XII was born, Francis I, Henry II, Charles IX and Henry III held their courts in it; and the Guises, by a cruel though not unjust retribution, were murdered in it. When Maria de Medici was, in 1617, exiled from the court, she resided, probably as a prisoner, in this castle, whence, 18 months later, she escaped through a high window, which is also an object of curiosity. In 1814, on the approach of the European armies to Paris, the Empress Maria Louisa and the council of regency repaired for a while to this place. Afterward the castle was entirely neglected and even used as barracks for cavalry. During the later years of Louis Philippe's reign, this curious specimen of architecture was carefully and tastefully restored. Blois has several literary and scientific societies, a botanical garden founded by Henry IV, a public library with 19,000 volumes, a departmental college and a diocesan seminary. It trades in wines, spirits, vinegar, staves and licorice, while it produces serges, hosiery and gloves, boots, shoes, biscuits, furniture, machinery, earthenware, cutlery and hardware, and there are tanneries, foundries and vinegar works. Pop. (1911) 23,995. Consult Le Nail, 'Le Château de Blois' (Paris 1874); Bournon, 'Blois, Chambord et les châteaux du Blésois' (Paris 1908).

BLOK, blŏk, **Alexander Alexandrovich,** Russian poet and man of letters: b. Petrograd 1880. He is the son of Alexander Lev Blok, professor of political science at the University of Warsaw. He received his education at the University of Petrograd. His first poems 'Novi Puti' ('New Roads') and 'Syeverny Tzveti' ('Flowers of the North') appeared in 1903 and were exceedingly well received. Of his collective works the verses about the 'Beautiful Lady' (1905), 'Snow Mask' (1907), 'Unexpected Joy' (1907) announced a virile poet with an extremely compound soul. His lyric dramas 'Balaganchik,' 'The King on the Market,' 'The White House,' 'The Song of the Fates,' etc., showed a further development of his unusually vivid imagination. Blok's poetry represents something entirely new in Russian literature; his romantic lyricism has created new types, new shadows, a new world of sphinxes moving about during the white nights on the celebrated Nevski Prospect in Petrograd. His is often called by the contemporary critics a «somnambulant» or «lunatic» whose visions are different from those of any other ordinary mortal. However, his powerful verses, his unique figures of speech and his wonderful discovery of a new magic in the Russian language have deserved for him a high place in the contemporary history of literature. Yet his dramas lack action and the dialogues in them are not as sparkling as his lyric verses. They are often too superficial to be called dramas, for there is no *idée maîtresse* in them nor a cohesive unity of action.

BLOMFIELD, Charles James, English divine: b. Bury-Saint-Edmunds, Suffolk, 29 May 1786; d. Fulham, 5 Aug. 1857. He studied for the Church at Cambridge, where he took high honors; and after filling several curacies, and acting for a time as chaplain to the bishop of London, was presented to the rectory of Saint Botolph, Bishopsgate. In 1824 he was made bishop of Chester, and in 1828 bishop of London. He acquired considerable renown as a classical scholar from the editions published by him of several of the dramas of Æschylus, and he also published an edition of Callimachus, which is much esteemed. Along with Rennel, he edited, in 1812, the 'Musæ Cantabrigienses,' and in 1814, along with Monk, the 'Posthumous Tracts' of Porson, followed two years afterward by the 'Adversaria Porsoni.' In his ecclesiastical capacity he displayed great zeal and energy, more churches having been built in London under his episcopate than under that of any bishop since the Reformation. He incurred, however, some animadversions on his proceedings in relation to the Tractarian controversy by a vacillating policy, which gave satisfaction to neither of the parties. Consult the biography by Blomfield (London 1863), and that by Biber (ib., 1857).

BLOMFIELD, Edward Valentine, English clergyman (brother of the preceding): b. 14 Feb. 1788; d. 3 Oct. 1816. He studied at Caius College, Cambridge and excited the highest expectations. Among several prizes which he gained was a medal assigned him in 1809 for his beautiful ode 'In Desiderium Porsoni.' In 1812 a fellowship in Emmanuel College was conferred on him, those of his own college being full. In 1813 he visited Germany, where he acquired a good knowledge of the German language, and became acquainted with Wolf in Berlin, and Schneider in Breslau. After his return he wrote in the 'Museum Criticum,' or 'Cambridge Classical Researches,' remarks on German literature which were received with approbation. The University of Cambridge appointed him one of the preachers of Saint Mary's Church. He began a translation of Schneider's 'Griechisch-Deutches Lexicon,' but did not live to finish it. Matthiæ's 'Griechische Grammatik,' however, he translated completely. His translation was published by his brother and was everywhere well received. He was in Switzerland in 1816 with his pupil, a young nobleman, and in his haste to return to Cambridge on hearing that he was appointed proctor for the following year, the fatigue of rapid traveling occasioned a sickness of which he died.

BLOMFIELD, Reginald, English architect: b. 20 Dec. 1856. He was educated at Exeter College, Oxford. Among his many important professional works are 'Brocklesby Park,' 'Caythorpe Court,' 'Holbrook House,' 'New Buildings at Haileybury College,' 'Lady Margaret Hall,' 'Portsea Institute.' He has published 'The Formal Garden in England' (1892); 'A History of Renaissance Architecture in England' two works of great value (1897); 'Short History of Renaissance Architecture in England' (1900); 'Studies in Architecture' (1906); 'The Mistress Art' (1908); 'Architectural Drawing and Draughtsmanship' (1912).

BLOMMAERT, blŏm-märt, **Philipp,** Flemish philologist: b. Ghent about 1809; d. 1871. He did much for the literature of his country by an edition of the old Flemish poets of the 11th, 12th, 13th and 14th centuries, with glossaries, notes and emendations. He also republished the 'Nibelungenlied,' translated into Dutch iambics. His best work, however, is the 'Aloude geschiedenis der Belgen of Nederduitschers,' in which he vindicates the claims of his country to an independent national existence and national literature. Blommaert also wrote French well, and was a contributor to the *Messager des Sciences Historiques.*

BLOMMAERT, Samuel, colonial patroon: b. 1590; d. 1670. He bought of the Indians a tract of land almost equal in size to the present State of Delaware, extending from Cape Henlopen to the mouth of the Delaware River. The deed for this land given him by Peter Minuit and his Council at Fort Amsterdam in 1630 is the oldest deed for land in Delaware. He formed a company to provide for the settlement of this land, and a colony was started named Swaanendale, but destroyed by the Indians after a few years in revenge for an act of the governor, Gillis Hosset.

BLOND, Jacques Christophe le, German printer of engravings: b. Frankfort-on-the-Main 1670; d. Paris 1741. He studied in Italy and lived some years in Amsterdam as a painter of miniatures, and later of larger portraits. He then came to England. He conceived the idea of an establishment to print engravings in colors according to the Lostman method of copperplate reproduction of mezzotints, and, obtaining means, produced many copies of engravings and pictures, which of course had defects, and the experiment failed. He now devoted himself to producing the cartoons of Raphael in tapestry, but this failed also, and he soon after died miserably in a French hospital.

BLONDEL, a confidential servant and instructor in music of Richard Cœur de Lion of England, about the year 1190. While his master was the prisoner of the Duke of Austria, Blondel went through Palestine and all parts of Germany in search of him. He understood, it is said, that a prisoner of rank was confined in Dürrenstein Castle, and hastened hither. Placing himself under a grated tower, he began to sing one of the French lays which he had formerly composed for Richard. Scarcely had he finished the first stanza when a voice from the dungeon of the tower responded. Thus he discovered his King, returned with all speed to England, obtained Richard's ransom and gained the name of the «faithful Blondel.» Grétry's fine opera, ‹Richard Cœur de Lion,› is founded on this anecdote. The earliest trace of this legend occurs in the ‹Chronicle of Rheims› (13th century). No mention of it is found in Blondel's acknowledged poems (Vol. XIX of Tarbé's ed.), Collection des poçtes ‹Champenois› (Rheims 1862).

BLONDEL, David (1596–1655), a noted French Protestant clergyman. In 1650 he succeeded J. G. Vosius in the professorship of history in Amsterdam. In this position he undertook deep researches. His works are many. In some of them he shows a remarkable critical faculty, as, for instance, in his dissertation on Pope Joan (1647-57) in which he came to the conclusion, now universally accepted, that the whole story is a mere myth. His keen critical sense and his power of deep thought made him iconoclastic in other directions, so that he excited considerable Protestant indignation, and became, for a time, very unpopular on account of this work on the Pope.

BLONDIN, blŏn-dăṅ, **Charles** (real name Jean François Gravelet), French acrobat; b. Saint Omer, Pas-de-Calais, 1824; d. Ealing, London, 22 Feb. 1897. He was trained at Lyons, where he made such rapid progress that he was designated «The Little Wonder.» After making a several years' tour of the United States, on 30 June 1859, before a crowd of 25,000 persons, he crossed the Falls of Niagara on a tight-rope in five minutes; on 4 July he crossed blindfold, trundling a wheelbarrow; on 19 August he carried a man on his back; on 14 Sept. 1860 he crossed on stilts in the presence of the Prince of Wales. His engagement at the Crystal Palace in 1862, where he performed on a rope 249 yards long and 170 feet from the ground, drew immense crowds. After several years' retirement he reappeared in 1880, and in 1888 again visited the United States. When the New York city authorities refused him permission to perform in Central Park, he gave a series of exhibitions on Staten Island, performing many extraordinary feats, such as carrying a stove to the centre of the line and making an omelet on it. Later in the same year he performed in London. His final performance was given at Belfast in 1896.

BLONDIN, Pierre Edouard, Canadian statesman: b. Saint François du Lac, county of Yamaska, 14 Dec. 1874. He was educated at the Seminaire de Nicolet and Laval University, Montreal, and was admitted a notary in 1910, and served as an alderman for Grande Mère. He was elected to the House of Commons for the county of Champlain in 1908 and became prominently identified with the Nationalist wing of the Conservative party; was appointed deputy speaker in 1911, Minister of Inland Revenue in 1914 and Secretary of State in 1915; Postmaster-General on 8 Jan. 1917, from which office he resigned 21 March of the same year in order to raise a French-Canadian regiment for service overseas. His resignation, however, was not accepted.

BLOOD, Thomas, English adventurer, better known as Colonel Blood: b. about 1618, probably in Ireland; d. Westminster, 24 Aug. 1680. He was the son of a blacksmith in easy circumstances; of his early life little is known, except that he took the Parliamentary side in the Irish rebellion. Having visited England about 1648, Blood married a Miss Holcroft of Lancashire and returned to Ireland. He was made a justice of the peace by Henry Cromwell and had large assignments of land as payment for his services and zeal. At the Restoration he was deprived of the lands and in reprisal he associated with such of the Cromwellians as were ripe for insurrection. Two of their designs were to surprise Dublin Castle and to seize the person of the lord-lieutenant, James Butler, Duke of Ormonde. Blood was at the head of these enterprises, planned for 9 or 10 March 1663. Betrayed by one of his associates, he managed to escape, although his chief accomplices were seized and executed. He made a bold attempt to rescue them. He eluded pursuit by fleeing to the remote mountain fortresses of Ireland and at last, when the danger became urgent, he quitted Ireland, and crossed to Holland, where he found a welcome among the disaffected sectaries. His daring spirit prompted him to return to England, where he associated with the Fifth Monarchy men. Seeing little chance for the furtherance of his schemes, he removed to Scotland and joined the Covenanters in their revolt, remaining with them till after the defeat at Pentland Hills in November 1666. Four years later Blood, with five companions, waylaid the Duke of Ormonde in Saint James street and tied him on horseback to one of the desperadoes. Nothing less was intended than to hurry the Duke to Tyburn, and there hang him in requital of his having hanged others. The Duke's attendants raised the alarm and rescued their master after he had unhorsed his riding companion and was struggling with him on the ground. On 9 May 1671 Blood made his great attempt to steal the crown jewels. Disguised as a clergyman and with three accomplices he entered the tower and succeeded in overpowering the keeper, Edwards, and in carrying off the jewels. They were immediately pursued, seized and thrown into jail. Instead of being executed for this attempt he met reward, being saved by his audacity. Blood refused to make confession except to the King himself, and Charles, at the suggestion of Buckingham, who was accused of having hired

Blood to make the attempt on Ormonde, visited Blood in prison. Blood threatened that his confederates would avenge his death, secured a pardon from Charles, together with his forfeited Irish estates of £500 annual value, and seemed to have interest at court, being often seen in the presence-chamber. Before long he quarreled with his protector, Buckingham, fell under accusation of conspiring to have him charged with an atrocious crime and was committed to prison. It is probable that it was a trick to ruin him. He found bail and returned to his home in Westminster. His health was broken and he died after an illness of 14 days. He was buried at Tothill Fields. Rumors being circulated that it had been a sham funeral, to keep the living man hidden, his body was exhumed and identified. Scott introduces Blood in ‹Peveril of the Peak.› Consult Seecombe, ‹Twelve Bad Men› (New York 1896).

BLOOD, the bright red to very dark red alkaline fluid that circulates through the heart, arteries and veins, carrying nutriment and oxygen to the bodily tissues, and conveying away from them waste material. The composition and character of the blood varies very widely in different animals, and hence this description is confined more particularly to the human blood. From the standpoint of cell-structure the blood is a tissue made up of a liquid plasma and solid cells or corpuscles. It contains at least four separate and important ingredients, the plasma, or blood serum; red cells, or erythrocytes; white cells, or leucocytes; and blood plates. About one-tenth to one-twelfth of the entire body is blood, of which nine-tenths is water.

Plasma.— The greater portion (56 per cent) of the blood is plasma. This plasma is composed of 90 per cent water containing gases, mineral salts, fats, nitrogenous bodies and carbohydrates in solution. It is a clear yellowish fluid. The mineral salts are sodium chloride, common salt, the most abundant; sodium carbonate, which renders the blood alkaline; potassium chloride, potassium sulphate, calcium phosphate, sodium phosphate, magnesium phosphate and calcium chloride. Traces of other inorganic salts are frequently found. The gases in the blood plasma are oxygen, nitrogen and carbon dioxide. Of the organic constituents the non-nitrogenous ones are the fats and carbohydrates, with small amounts of fatty coloring matters, lipochromes, cholesterin and sarcolactic acid. The fats are present in variable quantities, being particularly abundant following a meal. They are the glycerides of stearic, oleic and palmitic acids. The carbohydrates are at least three, glycogen, dextrose, or grape sugar, and animal gums. The non-protend nitrogenous constituents of the plasma consist largely of the waste extractives. The most important of these are urea, kreatin, kreatinin, uric acid and hippuric acid. Three ferments or enzymes are thought to be present in the plasma — a diastatic ferment, converting starches into sugars; a glycolytic enzyme, breaking up sugar, and a lipase, or fat-splitting enzyme. In addition, there is the ferment that causes coagulation. Whether this is present in the serum or in the white cells is a matter of inquiry. The proteids of the plasma are serum albumins, globulins (serum globulin and fibrinogen) and nucleo-proteids.

Red Cells.— These are the most abundant of the formed elements of the blood, making up 99 per cent of the corpuscles. There are thought to be in man as least 5,000,000 red blood-cells to every cubic millimetre of blood; their size, therefore, is very small, averaging in man 7.8 m.mm. They are flattened circular discs, with double depressed centres, one-fourth as thick as broad. In the embryo and in certain diseased states the red blood-cells have a nucleus, but the normal red blood-cell in man has lost this cell structure. Practically all of the mammals, save the camel tribe, have circular red blood-cells; the camels and most of the lower animals have oval red blood-cells; in the lower animals they are mostly nucleated. There is also great variation in size in the red cells of the various animals, being largest among the *amphibia* (Amphiuma 75 m.mm.). The red blood-cells are mostly manufactured in the marrow of the long bones. The chemical structure of the red cells is complex, but they contain an iron compound, hæmoglobin, which is the most important constituent of the blood in the process of respiration and oxidation; by it the complex processes of chemical interchange in the body (metabolism) are made possible. Poisoning of the hæmoglobin and the loss of its function means death by asphyxia. The hæmoglobin gives the reddish-yellow tinge to the blood, and the differences in shade between the venous blood and arterial blood are due to the state of oxidation of the hæmoglobin.

White Cells — Leucocytes.— These are much less numerous than the red cells, varying in number from 5,000 to 20,000 to the cubic millimetre. At least five different forms of white cells are normally present in human blood. These are large and small lymphocytes, polymorpho-nuclear neutrophiles, eosinophiles and transitional forms. Mast cells are another form of varying occurrence. The polymorph neutrophiles are the most numerous of the leucocytes and make up the greater mass in pus-cells. In shape and size these white cells differ, but all are spherical, some smaller than the red cells (6.7 m.mm.) but mostly larger (about 10 m.mm.), and all have one or more nuclei. The leucocytes are formed in a number of lymphatic tissues, the hæmolymph glands, the spleen, etc., and are among the most interesting of the constituents of the blood, since one of their chief functions is to protect the body from disease-producing micro-organisms. They may be aptly termed the human body's «army of the interior» in the fight with disease-causing agents. They are useful both physically (by eating, as it were, the bodies of invading bacteria — phagocytosis, q.v.) or chemically (in the elaborating of certain counter-poisons — antitoxins, q.v.) or in the manufacture of specific immunizing bodies for the blood-serum. (See IMMUNITY). Their careful study in diseased conditions is very helpful in arriving at a diagnosis of the disease process.

Blood Plates.— These are of frequent occurrence, but as yet little is known of their function. They are thought to be globulin-like in their nature and of use in the phenomenon of coagulation; others claim them as nucleo-proteids, made from the white blood-cells.

Functions of the Blood.— These, as already indicated, are numerous. Through the hæmoglobin, blood is the great oxidizing medium. It carries products for anabolism and products of katabolism, and is the great equalizer, by arterial pressure, of the osmotic pressures of all the cells of the body. As a means of defense in the struggle with parasitic invaders the blood is the most important of the body's bulwarks. See Anæmia; Bleeding; Chlorosis; Circulation; Hæmophilia; Leucæmia; Pernicious Anæmia.

Bibliography.— Bayliss, ‹General Physiology›; Cabot, ‹Clinical Examination of the Blood› (New York 1904); Ewing, ‹Clinical Pathology of the Blood›; Schäfer, ‹Physiology› (Vol. I, 1898); Starling, ‹Human Physiology.›

BLOOD, Avenger of, in Scripture, the nearest relation of any one that had died by manslaughter or murder, so called because it fell to him to punish the person who was guilty of the deed. In the political law of Israel the practice of punishment by the nearest relative, which had always been prevalent, was allowed to continue, while rules were laid down to prevent the chief abuses connected with it. The distinction was sharply drawn between murder and manslaughter. For the former no ransom or satisfaction was permitted. In the case of the latter, however, there were six cities set apart out of the number which the Levites occupied, placed at suitable distances over the extent of the land, three on each side of the Jordan, with roads leading to them which were well kept up, and these were cities of refuge to which the manslayer might flee and within which he might dwell in safety without fear of the avenger. But he was not permitted to return to his own place; in fact, he had no safety, if he left his place of refuge, until the death of the high-priest during whose term of office his misfortune had occurred. See Cities of Refuge.

BLOOD, Circulation of. The highly differentiated and marvelously regulated circulatory system in man furnishes striking evidence of evolutionary development in response to growing complexity of environmental demands. Unicellular animals and the lowest metazoa obtain from the surrounding fluid in which they live oxygen and nutritive material and excrete waste materials into it directly, the whole surface performing these functions. The movement of the fluid is maintained by the movements of the cell or body of the animal itself and by the influence of nutritive absorption. In the Polypi the movement receives aid besides from the action of cilia on the inner walls of the body. The division of physiological labor in the more complex and differentiated metazoa requires a special circulatory mechanism and a fluid which contains more specifically respiratory and nutritive elements. Therefore in the three-layered animal a circulatory system was evolved within a celom or body cavity. The fluid within this cavity is still, however, in some coelenterates merely water containing organic elements, but this gradually acquires a greater diversity of elements making for coagulability, more complete respiratory function and better fitting it for supplying varying tissues in their nutritive and excretory needs. It is only, however, in the vertebrates that the blood exhibits a constancy of composition and circulates in a completely closed system. Birds and mammals alone have reached a complete separation of the arterial and venous blood. The *Arthropoda* and *Insecta* have a circulatory system which consists of a pulsating heart which sends its current through the arteries into open spaces or lacunæ within the body cavity where the blood and tissues directly interchange their contents. The muscular movements of the body help to return the blood into a venous sinus from which it reaches the heart by slitlike apertures in the latter provided with valves. During its course the blood passes through the renals and gills. Capillaries are found instead of the lacunæ in the annelids, as the earthworm. The *Mollusca* have the heart provided with an auricle and a ventricle, as in the snail and whelk; two auricles, one on either side of the ventricle, as in the fresh-water mussel; or two auricles and two ventricles, as in the ark shells. Among the ascidians, which stand low in that division of animals to which the mollusks belong, the remarkable phenomenon is encountered of an alternating current, which is rhythmically propelled for equal periods in opposite directions. All vertebrated animals, except *Amphioxus,* have a heart which in most fishes consists of an auricle and a ventricle, but in the mud fishes (*Lepidosiren*) there are two auricles and one ventricle; and this trilocular heart is found in the amphibians and in most reptiles except the crocodiles, which, like birds and mammals, have a four-chambered organ consisting of two auricles and two ventricles. In the crocodiles, however, the two blood streams are not yet wholly separated because of a communication between the right aorta containing arterial blood and the left aorta containing venous blood. In the trilocular hearts the two currents are mixed in the single ventricle but a separation is gradually established by the extension of the ventricular septum which finally completely divides the ventricle.

History.— The correct knowledge of the circulation of the blood in the human organism dates from the investigations and discoveries of Harvey published in 1628. In reality the discovery of the circulation was a gradual accretion but it was Harvey who finally placed this knowledge upon an accurate basis, removing certain mistaken theories which were still accepted and demonstrating at last the circulatory process. Galen's physiological teachings had long held sway even though they had come to be considerably modified. This ancient physiologist distinguished, as others had already done, arteries from veins and exploded the still older theory that the arteries contained air. The veins, he believed, had their origin in the liver, proceeding from it in two great trunks; the portal vein carrying to the liver the food absorbed from the alimentary canal which was there converted into blood containing nutritive «natural spirits,» and the vena cava which divided into an ascending and a descending branch. The blood was carried to the right side of the heart where communicating pores in the septum united the two ventricles and where the action of the innate heat of the heart and the air obtained through respiration united to produce the «vital spirits» which make the blood fit for higher functions. The veins further carried the crude blood in an ebb and flow from the right side of the heart for the lower nutritive functions, while similarly the purer arterial blood from the left side supplied to the tissues their vital functions. From this arterial blood in the brain «animal spirits» were elaborated which were carried along the nerves to produce movements and the highest functions of the body.

This is the outline of the crude Galenic doctrine, and Vesalius, brilliant anatomist that he was, was content to accept it, although there are evidences that he was very skeptical regarding much of Galen's physiological teaching. It was particularly from the anatomical side that he was most skeptical; namely, because of the lack of tangible holes between the two sides of the heart, which were so important to the Galenists. His skepticism was taken up by his pupils and was also felt by others, one of them, Michael Servetus, who published a remarkable book, the ‹Restitutio Christianismi,› in which a much truer conception of the circulation of the blood was taught. This was as early as 1553. He rejected entirely the ancient doctrines and had grasped the true doctrine of the pulmonary circulation, the passage of the blood from the right side through the lungs to the left side. Servetus, however, was a theologian more than a physician and his early death probably prevented his further studies. Realdus Columbus, of Cremona, must be regarded as another link in the chain that led up to the final solution. He is thought to have been a tricky man, however, and one who would not hesitate to poach on another's preserves, and there are indications of his copying much from Vesalius' works and claiming them as his own. He was vain and ignorant, but in his book, ‹De Re Anatomica› (1559), he described correctly the plumonary circulation, but he was unable to draw from it the lessons that it implied. This, by many historians, is taken as evidence that he was only a copier, and that probably the work of Servetus had been seen by him and he had claimed the discovery as his own. Cæsalpinus, a noted botanist, was the first to appreciate the fact that on the contraction of the ventricles (systole) the blood was thrown into the aorta and into the pulmonary artery, and at its diastole it received the blood from the vena cava and the pulmonary vein. He also seemed to have grasped the fact of the flow of the blood from the arteries to the veins and of the flow along the veins to the heart. This was in 1571 and 1593. Thus Cæsalpinus had a true suggestion of the idea both of the pulmonary and systemic circulations. But Cæsalpinus' work seems to have been lost sight of, and another, Hieronymus Fabricius, had the honor to open the next door that led to Harvey's triumph. Fabricius called renewed attention to the valves in the veins, but missed their real function, and, although he was Harvey's teacher, he was more of a Galenist than a modern.

It is to William Harvey's credit, not so much that he was the discoverer of the physiology of circulation,— this, it can be seen from this brief recital, was of gradual accretion,— but that he was the first demonstrator of the process. He was the first physiological experimenter, and his work on the living animal has opened up to the world most of its priceless gifts in the field of medicine. It was by the faithful and prolonged study of many hearts of many animals that showed him that —

> " the motion of the heart consists in a certain universal tension, both of contraction in the line of its fibres, and constriction in every sense, that when the heart contracts it is emptied, that the motion which is in general regarded as the diastole of the heart is in truth its systole ";

— that the true work of the heart is not that it sucked blood in, but that it drove blood out. Cæsalpinus guessed at this, or may be knew it, but Harvey proved it, and, what is more, read the consequences. He saw clearly, then, the real function of the auricles and the ventricles and of their valves, and he applied the lessons of the lesser, or pulmonary circulation, to the greater, or systemic circulation, and thus rounded out the true natural history of the process. In his own words:

> " I frequently and seriously bethought me, and long revolved in my mind, what might be the quantity of blood which was transmitted, in how short a time its passage might be effected, and the like; and, not finding it possible that this could be supplied by the juices of the ingested aliment without the veins on the one hand becoming drained, and the arteries on the other hand becoming ruptured through the excessive charge of blood, unless the blood should somehow find its way from the arteries into the veins, and so return to the right side of the heart, I began to think might there not be *a motion, as it were in a circle*. Now this I afterward found to be true; and I finally saw that the blood, forced by the action of the left ventricle into the arteries, was distributed to the body at large, and its several parts, in the same manner as it is sent to the lungs, impelled by the right ventricle into the pulmonary artery, and that it then passed through the veins and along the vena cava, and so round to the left ventricle in the manner already indicated, which motion we may be allowed to call circular."

Thus clearly and forcefully he set forth in 1616 — although his work did not appear until 1628 — the true doctrine, and it is of interest to record that he lived to see it adopted practically by all scientists. Malphigi, in 1661, demonstrated, by means of the microscope, the capillaries, thus filling out the last link in the chain of evidence.

Mechanics of Circulation.— The closed circulatory system in man consists of the heart, arteries, capillaries and veins. The heart is a muscular pump which beats regularly about 72 times a minute, thus forcing the blood with considerable velocity and force through the arteries and capillaries and back through the veins to enter the heart once more and so complete the circuit. The mammal heart, as we have seen, has become a double organ and each side consists of two chambers, the auricles and ventricles.

The auricles are the smaller, less muscular portions of the heart, since their function is merely to receive the blood and transmit it to the ventricles. The walls of the left ventricle are four times the thickness of those of the right ventricle, since upon the left ventricle falls the work of propulsion for the entire systemic circulation, while the right ventricle has but to send the blood through the pulmonary vessels. The direction of the course of the blood through the heart is maintained by the presence and arrangement of valves which guard the orifices between auricles and ventricles and the opening of the aorta and of the pulmonary artery. The tricuspid valve, consisting of three flaps of fibrous tissue, guards the right auriculo-ventricular opening, and the bicuspid or mitral valve, consisting of two flaps, guards the left. Near the base of attachment these flaps are tough and able to withstand the pressure of the blood, while at the edges they are thin and delicate and yield to the force of the current. When the blood has passed into the ventricle they form by their perfect apposition an effective guard against return of the blood to the emptied auricle. The muscular attachments of the valves at the same time extend the diaphragm formed by their closing into the ventricle sufficiently to contract the ventricular chamber and so assist in expelling the blood. A backward eddy of the blood in the ventricle maintains the closure of the valves. Similar arrangement guards the proper closure of the aortic and pulmonary valves.

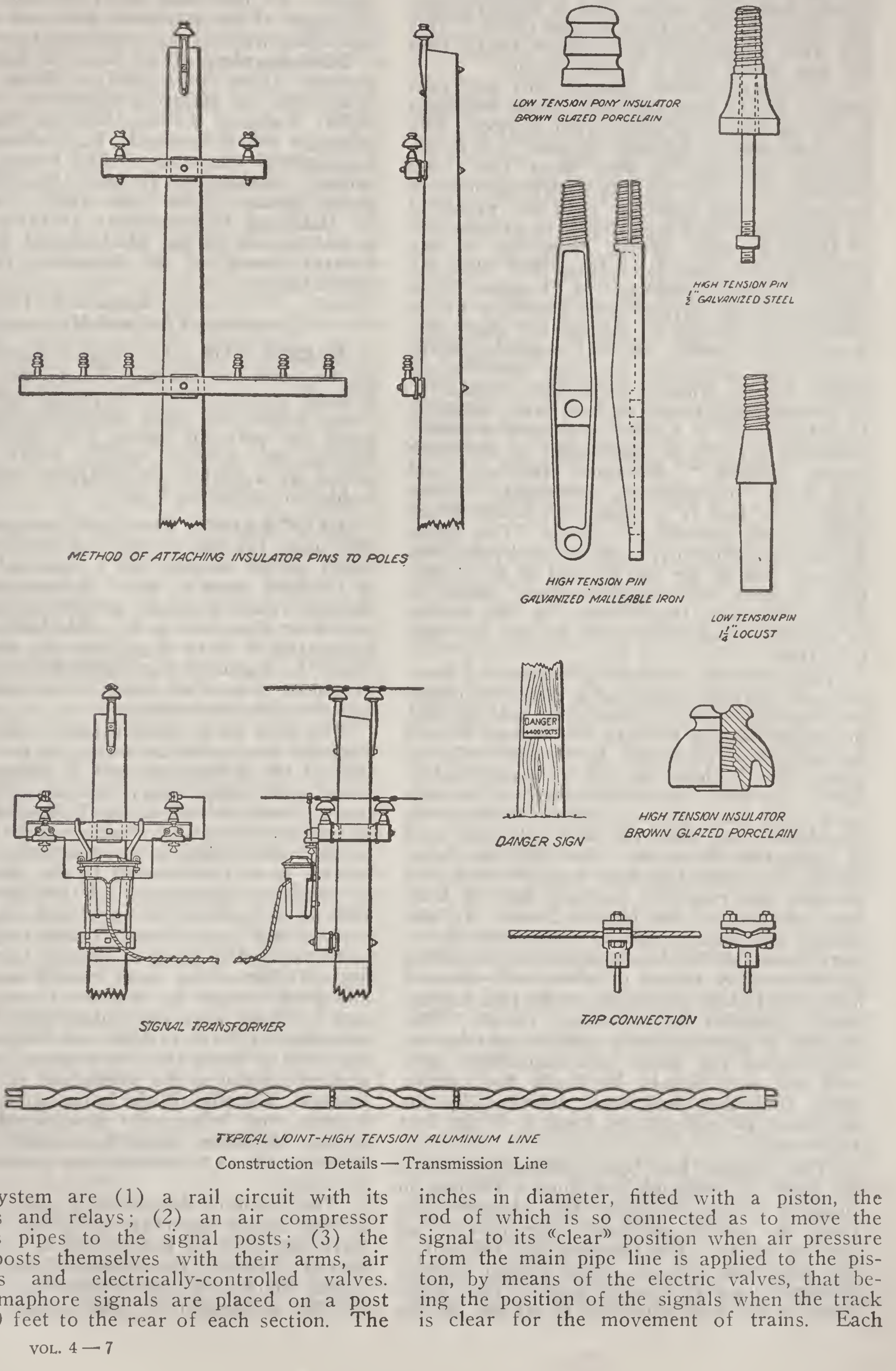
There are in reality two circulations, the pulmonary and the systemic. The dark, venous blood returned from the circuit through the body, the systemic circulation, where it has become charged with waste products and other impurities is poured into the right auricle. This contracts, the tricuspid valve opens and the blood is discharged into the right ventricle. Here it remains a small fraction of a second, when this ventricle contracts, the tricuspid valve closes and the blood is driven through the pulmonary artery into the lungs where it is spread out through the millions of capillaries distributed throughout the lung tissue. Here it is freed from its carbon dioxide, oxygenated and then returned through the pulmonary vein into the left auricle. The contraction of the left auricle discharges this oxygenated blood through the mitral opening into the left ventricle, whose powerful contraction sends it into the aorta to perform its systemic circuit, which distributes it to the arteries supplying all parts of the body by their continuation through the arterioles which end in turn in the capillaries distributed throughout all the tissues. Here the blood through the thin capillary walls comes into contact with the intermediary fluid known as the lymph, which fills all the tissue spaces through which by osmosis an interchange takes place. The blood exchanges its oxygen and nutritive elements for the waste matter of the body and effects that transference of chemical substances from the organs in which they are produced to those others in any way depending on their activity. This includes the transmission not only of the elaborated products of digestion but likewise the internal secretions or hormones, the importance of which is coming to recognition. From the capillaries, after exchange of products with the tissues through the lymph has taken place, the blood is collected by venules into the veins, which finally unite into the vena cava which carries the blood back to the right auricle. The contraction of both sides of the heart is a simultaneous one. It consists in reality of a wave of contractions passing over the heart muscle, the period of contraction being known as the systole, while the intervening period of rest and relaxation is known as the diastole. The complete cycle of contraction and relaxation with the circulation of the blood through the body occupies about 22 seconds, and occurs in the adult normally about 72 times in a minute. The audible sound on examination is due to the closing of the auriculo-ventricular valves and those at the entrance of the aorta and pulmonary artery. The pulse which can be felt in various superficial localities is due to the expansion of the distensible arterial walls. The elasticity of the arterial walls is an important factor in regulating the original force of the blood flow. Their distension changes the intermittent propulsive flow into a more steady current, while their ready contractility after distension regulates the distribution of the blood stream to the various organs. Pressure is gradually diminished until in the veins there is merely a uniform flow of the returning blood. The contraction of the heart muscles is due to a series of complicated nervous mechanisms. The heart musculature manifests in its arrangement its development from an original muscular tube which, while it has been modified into the separate chambers of the mammalian heart, has yet retained its continuity in the band of muscular fibres discovered by His (auriculo-ventricular bundle) which allows the contraction impulse to proceed successively from the root of this bundle in the right auricle to the ventricles. The excitation of the heart muscle seems to be due to the molecular concentration of the fluid which bathes the tissue. The heart is also under the control of a special innervation which adapts it to conditions of the organism and to changes in the arterial resistance. The vagus nerve from the medulla oblongata exercises an inhibitory function while sympathetic fibres running from the upper dorsal region of the spinal cord exercise a stimulatory function. Sensations arising in the heart are carried through the sympathetic ganglia and the upper thoracic region of the spinal cord where they are referred to the sensory nerves of adjacent regions with which they come into relation, so that cardiac pain is not recognized as such but as sensation in these regions. The walls of the blood vessels are also richly supplied with nerves which regulate their tonicity and thus adapt them to the changing conditions of the body organism. These are the vasomotor nerves and consist of the vasoconstrictors which exert a tonic effect and bring about a contraction of the vessels and the vasodilator nerves, which as the name implies dilate the vessels. The heart has its special system of blood supply in the coronary vessels, the blood entering the coronary arteries from the aorta and passing into capillaries which surround all the fibres. See ARTERIES; BLOOD; BLOOD PRESSURE; CAPILLARIES; HEART; VEINS.

SMITH ELY JELLIFFE.

BLOOD, Council of, the name popularly applied to the Council of Troubles, established by the Duke of Alva, in the Netherlands, in 1567. Although it had no charter or authority from any source, it was omnipotent and superseded all other authorities. In the first three months alone its victims numbered 1,800, and soon there was hardly a Protestant house in the Netherlands that had not furnished a victim.

BLOOD, Diseases of the. Blood is a very complex substance, it is even called a tissue. It has two essential parts, the plasma, composing 60 per cent, and the corpuscles, 40 per cent: the latter are not in solution but from the clockwork disc to the electro-pneumatic semaphore; from the electro-pneumatic semaphore to the enclosed disc; from the enclosed disc to the electro-gas semaphore; and finally to the highly perfected electric motor semaphore.

The general features of the electro-pneumatic system are (1) a rail circuit with its batteries and relays; (2) an air compressor with its pipes to the signal posts; (3) the signal posts themselves with their arms, air cylinders and electrically-controlled valves. Two semaphore signals are placed on a post about 50 feet to the rear of each section. The upper one, according to the general practice, is the «danger» or home signal, is painted red and governs the section immediately ahead; the lower one is the «caution» signal, is painted green (or yellow) and works in harmony with the «danger» signal of the next section. Each semaphore is operated by a cylinder three inches in diameter, fitted with a piston, the rod of which is so connected as to move the signal to its «clear» position when air pressure from the main pipe line is applied to the piston, by means of the electric valves, that being the position of the signals when the track is clear for the movement of trains. Each


METHOD OF ATTACHING INSULATOR PINS TO POLES

LOW TENSION PONY INSULATOR BROWN GLAZED PORCELAIN

HIGH TENSION PIN ½" GALVANIZED STEEL

HIGH TENSION PIN GALVANIZED MALLEABLE IRON

LOW TENSION PIN 1¼" LOCUST

DANGER SIGN

HIGH TENSION INSULATOR BROWN GLAZED PORCELAIN

SIGNAL TRANSFORMER

TAP CONNECTION

TYPICAL JOINT-HIGH TENSION ALUMINUM LINE

Construction Details — Transmission Line signal blade carries an appropriately colored lens, which covers a light when the blade is in the horizontal position, showing red if it is the upper signal, and green (or yellow) if it is the lower signal. A white (or green) light is exposed when the signal is in position to indicate that the track is clear.

The electro-gas apparatus is similar to the electro-pneumatic, except that it employs compressed carbonic acid gas instead of air. This gas when compressed is far more elastic than air, and works with a livelier action.

The electric motor mechanisms are considered by the most advanced signal engineers to be the best all around power devices. The one considerable difficulty in their use is the absolute necessity to keep them free from moisture. In spite of this drawback, not yet overcome, many miles of road are protected by them and with a high degree of satisfaction.

History.— The actual operation of the block signal system dates from 1839 when the Great Western Railway, of England, first telegraphed the arrival and departure of its trains from station to station for short distances near London. In 1841, separate instruments were introduced for each direction of traffic, showing whether the sections were clear or blocked, and telegraph bells were installed. In 1842, Sir W. F. Cooke, an English engineer, published a series of suggestions of the block system entitled ‹Telegraphic Railways› and laid down the following principles: «Every point of a line is a dangerous point, which ought to be covered by signals. The whole distance, consequently, ought to be divided into sections, and at the end as well as the beginning of them, there ought to be a signal, by means of which the entrance to the section is opened to each train when we are sure that it is free.»

The constantly increasing volume of business on railroads necessitated improved means for securing safety in operation, and in 1851 the South Eastern Railway of England devised the method of signaling by electric bells, by sound only, without the use of needle instruments. In 1854, separate instruments for each track, with three positions of the needle, were introduced, and later the bell code was used in connection therewith. In 1875, the Sykes system of block signaling was invented and brought into extensive use, not only in England but also in the United States. In this system the outdoor signals at a block station were controlled by the signalman at the station in advance, by means of electrically-operated locks, the locking apparatus at the two stations being connected by an electric circuit. This effected a decided check against mistakes or carelessness, for while each signalman operated his own signals, he could not operate them until they had been unlocked by the signalman in advance, on request of the first signalman.

The advance has been continually toward the point of reducing the human element in signaling to a minimum, the ultimate goal being the strictly automatic operation of all running signals. The selection by a railroad of any particular type of signal system depends primarily upon its cost to install. The automatic is the most expensive to set up, but the least expensive to operate, and the trend is constantly toward expenditures which actually insure the road against heavy losses through accidents.

Out of the 220,801 miles of railroad track on which passenger trains were being operated in the United States on 1 Jan. 1916, 124,447 miles were protected by some form of block signals. Of this total, on 51,120 miles the signals were of the automatic type, and on 73,327 miles they were of non-automatic types.

Bibliography.— ‹The Railroad Signal Dictionary› (New York 1911); Elliott, W. H., ‹The ABC of Railroad Signalling› (Chicago 1909); Latimer, J. B., ‹Railway Signalling› (Chicago 1908); Lewis, L. P., ‹Railway Signal Engineering› (London 1912); Pigg, J., ‹Signalling› (London n.d.); Scott, R., ‹Automatic Block Signals› (New York 1908); Webb, W. L., ‹Railroad Construction› (1913); and the annual reports of the Block Signal and Train Control Board of the Interstate Commerce Commission.

Edward S. Farrow,
Consulting Civil and Military Engineer.

BLOCK TIN. An inferior variety of tin in the form of blocks. When the metal is reduced in a furnace it is poured into molds. These ingots are later heated to the fusion point, the pure tin fusing first is drawn off, leaving the inferior quality which is now melted at a higher temperature, poured into molds and called block tin.

BLOCKADE. The term blockade, properly used, involves a state of war. The so-called pacific blockade is a form of reprisal or restraint short of war. A blockade is also distinct from domestic prohibition of intercourse or closure of ports. Blockade does not necessarily in later days have any relation to siege. In a general way, blockade is an attempt to cut off a port or coast of an enemy from maritime communication.

The idea as to what actually constitutes a blockade has varied according to the relationship of the belligerents and in different wars. Prior to the 16th century blockades were sometimes proclaimed when one belligerent wished to apprehend commerce bound for certain ports of the other belligerent. Gradually the idea became more clear owing to the development of maritime commerce. A proclamation of 1630 mentions that it is in accord with ancient custom that neutral vessels and cargoes may be confiscated if going to, coming from or sailing near the enemy ports «which are continually held blocked by vessels of war at great cost.» There were many departures from the principle set forth in 1630 and belligerents endeavored to obtain the advantages of a blockade without assuming the obligations of its maintenance. Usually, till the latter part of the 18th century, the belligerents proclaimed and enforced blockades somewhat arbitrarily, even going so far as to interdict any commerce with an enemy.

The action of the northern states of Europe in the armed neutrality of 1780, which was later approved by France, Spain and Austria, served to modify the extreme claims of belligerents which had been developing. Article IV of the declaration of the armed neutrality stated "that in order to determine what characterized a blockaded port, that name should be accorded only to a port where by act of the power making the attack vessels anchored sufficiently near should make it dangerous to enter." In 1800 Russia and Sweden agreed that a notification to the neutral vessel by the blockading force was necessary in order to render the neutral vessel liable to penalty.

The recognition of neutral rights secured by the armed neutralities of 1780 and 1800 was not continued in the early years of the 19th century, when by decrees and orders in council Napoleon and Great Britain tried to destroy all commerce. During the first half of the 19th century there was a tendency to extend the belligerent interference with commerce at the expense of neutrals. At times areas of great extent were declared blockaded and no considerable force was sent to maintain the blockade. In one case in 1816 the penalty of death by hanging at the yard-arm was mentioned for the master or other principal officers of a vessel entering prohibited area. Against the extreme extension of the area of blockade President Monroe in 1816 protested, and in following years other American Presidents protested, in general endeavoring to secure large liberty for neutrals. Proclamations were issued by belligerents making the presence of military officers and merchants of the enemy on board, or presence within six miles of the coast with contraband on board evidence of intention on the part of a vessel to violate a blockade. In 1825 Brazil proposed to require bonds from neutral vessels that they would not violate blockade. The United States replied that "A blockade must execute itself." Attempts were made to establish blockades which would allow ships of certain nationalities to pass while closing the ports to others and to continue a blockade for two months after the treaty of peace. While there were such great variations in proclamations, the differences in application of the principles were even greater.

There seems, therefore, as regards blockade, ample reason for the statement in the Declaration of Paris of 1856, signed by Austria, France, Great Britain, Prussia, Russia, Sardinia and Turkey, "That maritime law in time of war has long been the subject of deplorable disputes." It was the aim of this declaration to establish a "uniform doctrine" on certain points, among these, blockade. Accordingly the fourth article of the Declaration provides: "Blockades, in order to be binding, must be effective — that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy."

The United States, China, Mexico and Spain did not become parties to this declaration. Questions soon arose in regard to the interpretation of this clause which it had been hoped would end many of the "deplorable disputes." Apparently to make the clause more clear the British Admiralty Manual added "or, at any rate, to create evident danger to ships attempting ingress or egress."

The Civil War in the United States put some of the doctrines in regard to blockade to the test. The French had generally maintained that liability for violation of blockade was conditioned upon notification of the blockade to a vessel approaching the line by a vessel of the blockading force. Great Britain and the United States had contended that a general public notification was sufficient. These ideas were therefore in conflict. Questions were raised as to the effectiveness of a blockade which depended upon the co-operation of shore batteries or upon the closing of certain navigable channels by the sinking of vessels, stones or other obstructions. The extent of coast line which might be blockaded effectively by such forces as the Northern States had at their disposal was in doubt. Great Britain in the case of the *Helen* in 1865 stated the British and American point of view at that time, saying, "There are several conditions to be observed in order to justify the seizure of a ship for breach of blockade. The blockade must be effectual and (save accidental interruption by weather) constantly enforced. The neutral vessel must be taken *in delicto*. The blockade must be enforced against all nations alike, including the belligerent one. When all the necessary conditions are satisfied, then, by the usage of nations, the belligerent is allowed to capture and condemn neutral vessels without remonstrance from the neutral state." (1865, L. R. 1 A. & E. 1).

Certain principles became more definite through the decisions in consequence of the Spanish-American War of 1898. As to the number of vessels necessary, the Supreme Court of the United States said, "As we hold that an effective blockade is a blockade so effective as to make it dangerous in fact for vessels to attempt to enter the blockaded port, it follows that the question of effectiveness is not controlled by the number of the blockading force. In other words, the position cannot be maintained that one modern cruiser though sufficient in fact is not sufficient in law." (*The Olinde Rodriguez*, 174 U. S. 510). It was also stated that a captured vessel was not in condition to dispute the effectiveness of the force which captured her, and further it was thought "a sufficient compliance with the obligations of international law if the blockade made egress or ingress dangerous in fact." In the Russo-Japanese War, 1904–05, the Japanese regulations provided that:

"Blockade is to close an enemy's port, bay or coast with force, and is effective when the force is strong enough to threaten any vessels that attempt to go in or out of the blockaded port or bay or to approach the coast."

The duration of liability to capture had been subject to difference of opinion. Continental opinion has inclined to the side of liability only when taken in the act or when continuously pursued. British and American opinion has made liability to begin upon departure on the voyage and to terminate with its completion when the intent to violate a blockade is present, and if a vessel has escaped from a blockaded port the liability to capture continues until the vessel reaches her home port. An attempt was made by the International Naval Conference of 1908–09 to reconcile in the Declaration of London these and many other differences of opinion upon details of instituting and maintaining a blockade. This naval conference represented the United States, Germany, Austria, Spain, France, Great Britain, Italy, Japan, Netherlands and Russia, the powers especially concerned with the conduct of naval warfare. The conclusions were declared «to correspond in substance to the generally recognized principles of international law.» The articles relating to blockade in the Declaration of London numbered 21 and embody what up to August 1914, when war broke out in Europe, was regarded as a satisfactory statement of the law of blockade. These articles are as follows:

«Article 1. A blockade must be limited to the ports and coasts belonging to or occupied by the enemy.

Art 2. In accordance with the Declaration of Paris of 1856, a blockade, in order to be binding, must be effective — that is to say, it must be maintained by a force sufficient really to prevent access to the enemy coast.

Art. 3. The question whether a blockade is effective is a question of fact.

Art. 4. A blockade is not regarded as raised if the blockading forces are temporarily driven off by bad weather.

Art. 5. A blockade must be applied impartially to the ships of all nations.

Art. 6. The commander of a blockading force may grant to a warship permission to enter, and subsequently to leave, a blockaded port.

Art. 7. In circumstances of distress, acknowledged by an authority of the blockading forces, a neutral vessel may enter a place under blockade and subsequently leave it, provided that she has neither discharged nor shipped any cargo there.

Art. 8. A blockade, in order to be binding, must be declared in accordance with article 9, and notified in accordance with articles 11 and 16.

Art. 9. A declaration of blockade is made either by the blockading power or by the naval authorities acting in its name.

It specifies —

(1) The date when the blockade begins;

(2) The geographical limits of the coast blockaded;

(3) The delay to be allowed to neutral vessels for departure.

Art. 10. If the blockading power, or the naval authorities acting in its name, do not establish the blockade in conformity with the provisions which, in accordance with article 9 (1) and (2), must be inserted in the declaration of blockade, the declaration is void, and a new declaration is necessary in order to make the blockade operative.

Art. 11. A declaration of blockade is notified —

(1) To the neutral powers, by the blockading power by means of a communication addressed to the governments themselves, or to their representatives accredited to it.

(2) To the local authorities, by the officer commanding the blockading force. These authorities will, on their part, inform, as soon as possible, the foreign consuls who exercise their functions in the port or on the coast blockaded.

Art. 12. The rules relative to the declaration and to the notification of blockade are applicable in the case in which the blockade may have been extended or may have been reestablished after having been raised.

Art. 13. The voluntary raising of a blockade, as also any limitation which may be introduced, must be notified in the manner prescribed by article 11.

Art. 14. The liability of a neutral vessel to capture for breach of blockade is contingent on her knowledge, actual or presumptive, of the blockade.

Art. 15. Failing proof to the contrary, knowledge of the blockade is presumed if the vessel left a neutral port subsequently to the notification of the blockade made in sufficient time to the power to which such port belongs.

Art. 16. If a vessel which approaches a blockaded port does not know or cannot be presumed to know of the blockade, the notification must be made to the vessel itself by an officer of one of the ships of the blockading force. This notification must be entered in the vessel's log book, with entry of the day and hour, as also of the geographical position of the vessel at the time.

A neutral vessel which leaves a blockaded port must be allowed to pass free if, through the negligence of the officer commanding the blockading force, no declaration of blockade has been sent to the local authorities, or if, in the declaration as notified, no delay has been indicated.

Art. 17. The seizure of neutral vessels for violation of blockade may be made only within the radius of action of the ships of war assigned to maintain an effective blockade.

Art. 18. The blockading forces must not bar access to the ports or to the coasts of neutrals.

Art. 19. Whatever may be the ulterior destination of the vessel or of her cargo, the evidence of violation of blockade is not sufficiently conclusive to authorize the seizure of the vessel if she is at the time bound toward an unblockaded port.

Art. 20. A vessel which in violation of blockade has left a blockaded port or has attempted to enter the port is liable to capture so long as she is pursued by a ship of the blockading force. If the pursuit is abandoned, or if the blockade is raised, her capture can no longer be effected.

Art. 21. A vessel found guilty of violation of blockade is liable to condemnation. The cargo is also liable to condemnation, unless it is proved that at the time the goods were shipped the shipper neither knew nor could have known of the intention to violate the blockade.»

At the outbreak of the European War in 1914 the above articles were practically contained in the regulations of the belligerents, and certain blockades were proclaimed and maintained in accord with these articles. One of the earliest of these proclamations was issued by Great Britain on 23 Feb. 1915, declaring the coast of German East Africa between certain points under blockade from midnight 28 February–1 March and allowing four days of grace for departure of neutral vessels from the blockaded area. Similar proclamations were issued for the Cameroons on 24 April 1915, and for the coast of Asia Minor on 1 June 1915.

The British and French proposed, in a note of 1 March 1915, in retaliation for the war zone proclamation of Germany, to take measures "to prevent commodities of any kind from reaching or leaving Germany." Under these measures, it was said, "The British and French governments will therefore hold themselves free to detain and take into port ships carrying goods of presumed enemy destination, ownership or origin. It is not intended to confiscate such vessels or cargoes unless they would otherwise be liable to confiscation." Of this proposition the United States government, in a note of 5 March 1915, said: "The first sentence claims a right pertaining only to a state of blockade. The last sentence proposes a treatment of ships and cargoes as if no blockade existed. The two together present a proposed course of action previously unknown to international law." Other correspondence followed upon this so-called blockade measure. The United States, in a long note of 21 Oct. 1915, asserted that "It is incumbent upon the United States government, therefore, to give the British government notice that the blockade which they claim to have instituted under the Order in Council of 11 March cannot be recognized as a legal blockade by the United States." The reasons given were that the British measures did not constitute "a blockade in law, in practice or in effect." Referring to the American contention that the British blockade of Germany was not effective because German ports were open to Scandinavian trade, the British note of 24 April 1916 advances the proposition that "even if these measures were judged with strict reference to the rules applicable to blockades, a standard by which, in their view, the measures of the Allies ought not to be judged, it must be remembered that the passage of commerce to a blockaded area across a land frontier or across an inland sea has never been held to interfere with the effectiveness of the blockade." In the preceding paragraph, the same note says, "that the rules applicable to a blockade of enemy ports are strictly followed by the Allies in cases where they apply, as, for instance, in the blockades which have been declared of the Turkish coast of Asia Minor, or the coast-line of German East Africa." In the practice in regard to continental Germany there is therefore admittedly a claim to extension of rights which at the outbreak of the war were not regarded as belonging to belligerents engaging in blockading operations. Of this Prof. Sir Erle Richards has said "It is certain that the rights with regard to blockade must be extended if the right is to continue." The United States has, however, in objecting to innovations in practice during war said, "It is of the highest importance to neutrals, not only of the present day but of the future, that the principles of international right be maintained unimpaired." See ARMED NEUTRALITY; DECLARATION OF LONDON; INTERNATIONAL LAW; MERCHANT VESSELS, NEUTRAL, RIGHTS OF; NEUTRALITY; WAR, EUROPEAN.

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BLOCKHOUSE, in fortification, a house made of beams joined together crosswise, and often double, with a covering and loopholes, large enough for from 25 to 100 men. In addition to this, it is commonly covered with earth, to render it entirely bomb- and fireproof. Forts of this kind are often fitted up to receive cannon. Blockhouses are generally built in the form of a square or a cross. Their use is to afford a feeble garrison of an important place, which is very much exposed, an opportunity of holding out against the cannonade and assault of the enemy till they are relieved. They also serve for bomb-proof guardhouses and places of last resort, in the interior of intrenchments and in the covered passages of fortresses, where the cannon are stationed. Blockhouses were much employed as a defense against Indians in America, by the French in Algeria and by the Spanish in Cuba, where a line of blockhouses connected by wire barricades was built across the island in 1898. See FORTIFICATION.

BLOCKS OF FIVE, a political expression in the United States, originating in the presidential campaign of 1888. A letter purporting to have been written by the treasurer of the Republican National Committee to the chairman of the Indiana State Committee, recommending securing "floaters in blocks of five." This was construed to mean the bribery of voters at wholesale rates. The Democratic managers circulated the letter as widely as possible, before election. Proceedings for libel were afterward begun, but never brought to trial.

BLOCKSBERG, the name of several elevations in Germany, particularly the Brocken, forming the summit of the Hartz Mountains and the highest point in the northern part of the empire. In old legends the Brocken is the haunt of the witches, who there celebrated with orgies the first of May, *Walpurgisnacht.* See WALPURGA.

BLODGET, Lorin, American statistician: b. near Jamestown, N. Y., 25 May 1823; d. Philadelphia, 24 March 1901. He was educated at Hobart College; appointed assistant professor at the Smithsonian Institution, Washington, D. C., in charge of researches on climatology, 1851; was employed on the Pacific Railroad survey for the War Department, 1852–56; and was engaged in the United States Treasury Department, 1863–77. He was also editor of the Philadelphia *North American,* and secretary of the board of trade of that city, 1858–64. He is credited with having laid the foundation of American climatology. His publications include 'The Climatology of the United States' (1857), a work that met high favor in the United States and Europe; 'Commercial and Financial Resources of the United States'; and about 150 volumes of reports on finance, industrial progress and kindred subjects.

BLODGETT, Henry Williams, American jurist: b. Amherst, Mass., 21 July 1821; d. Waukegan, Ill., 9 Feb. 1905. He was educated at Amherst Academy; studied surveying and engineering; was admitted to the bar in 1844; and settled in Waukegan, Ill., to practice, in the following year. He served in the lower house of the legislature, 1852–54, and in the State senate, 1859–65; and was United States district judge for the Northern District of Illinois, 1869–93, when he retired. He was appointed one of the counsel on the part of the United States before the arbitration tribunal on the Bering Sea fur-seal controversy between the United States and Great Britain, in 1892.

BLODGETT, Samuel, American inventor: b. Woburn, Mass., 1 April 1724; d. Haverhill, Mass., 1 Sept. 1807. He took part in the French and Indian War; was a member of the expedition against Louisburg in 1745; and subsequently became a judge of the Court of Common Pleas in Hillsboro County, N. H. He was the inventor of an apparatus by which he recovered a valuable cargo from a sunken ship near Plymouth, Mass., in 1783. His success led him to go to Europe for similar enterprises. He met with no encouragement in Spain, and in England proposed to raise the *Royal George*, which went down off Spithead with 800 persons on board, but his proposition was not accepted. In 1793 he began the construction of the canal around Amoskeag Falls in the Merrimac, but did not live to complete the work.

BLOEMAERT, bloo'märt, or **BLOM, Abraham,** Dutch painter: b. Gorkum, 25 Dec. 1564; d. Utrecht, 27 Jan. 1647, or more probably 1657. He came to Paris about 1580 and there studied under Herry, Bassot and Franck. After spending some time in Amsterdam, where his father had become city architect, he settled at Utrecht in 1595. After 1600 he was prominent in Saint Luke's Guild of that city. Up to an advanced age he continued to teach painting, to paint and to engrave. His paintings are reproached with various faults, yet he is distinguished by the brilliancy of his coloring and the richness of his invention. He painted all sorts of objects, but his landscapes are the most esteemed. Consult Van Mander, 'Le Livre des peintres' (1885). He had four sons, of whom CORNELIUS (b. Utrecht 1603; d. Rome 1680), was a distinguished engraver.

BLOEMEN, Jan Frans van, Flemish painter: b. Antwerp, 12 May 1662; d. Rome 1748. At first he studied under Gouban, was attracted to Italy and there came under the influence of Claude Lorrain and Dughet. He was surnamed «Orizzonte,» an allusion to the great beauty of the coloring he put into his landscapes.

BLOEMEN, Pieter van, Flemish painter, brother of Jan Frans: b. Antwerp 1651; d. 1720. He was made apprentice in 1667; becoming master in 1674, he set out for Rome where he remained for 20 years and where he received the surname of «Standaart.» Returning to his native city he was appointed dean of the Guild of Saint Luke there. His work is chiefly landscapes and military subjects.

BLOEMFONTEIN, bloom'fŏn-tīn, Orange River Colony, South Africa, the chief town and seat of government of the colony, 680 miles northeast of Cape Town, situated in an elevated and healthy region. It stands on a plain surrounded by low hills, and is regularly laid out, having a large market-square in the centre. It has several fine buildings, including the Anglican cathedral, the Dutch Reformed church and other places of worship; the presidency; the town-hall; the post office; the library; the national museum; the new Raadzaal, or council-chamber of the legislature; the old Raadzaal; Grey College and Saint Andrew's College for boys; the Eunice Institute for girls; a government hospital and a cottage hospital; a lunatic asylum, etc. It is on the main railway line of the Colony, which is continuous with the Cape Colony and Transvaal systems. In the war between Great Britain and the South African and Orange Free State republics in 1899–1902 it was the seat of important military operations. In June 1899, a conference was held here between President Kruger of the South African republic and Sir Alfred Milner, the British Commissioner of Cape Colony, with a view of averting war. After the appointment of Lord Roberts to the supreme command of the British forces operating against the Boers, he led an expedition against the city and forced its surrender on 13 March 1900. Soon afterward the republic was formally placed under British administration, and it is now a part of the Union of South Africa. It is a centre of trade which consists mainly of wool. The industries include manufactories of aërated waters, salt, flour mills and breweries. Pop. about 15,000, half being whites.

BLOIS, blwä (anciently BLESUM), France, the capital of the department of Loir-et-Cher, 99 miles south-southwest of Paris, situated on the right bank of the Loire, from which it rises in the form of an amphitheatre. It consists of an upper town, with very narrow and crooked streets; a lower town, with many handsome houses, extending along a handsome quay; and of several suburbs, with one of which it communicates by a stone bridge of 11 arches. The city is furnished with spring water through an old Roman aqueduct, in excellent preservation. Thierry, the historian, was born here. The castle of Blois is rich in historical associations. It was long occupied by the counts of the name, and became a favorite residence of the kings of France. Louis XII was born, Francis I, Henry II, Charles IX and Henry III held their courts in it; and the Guises, by a cruel though not unjust retribution, were murdered in it. When Maria de Medici was, in 1617, exiled from the court, she resided, probably as a prisoner, in this castle, whence, 18 months later, she escaped through a high window, which is also an object of curiosity. In 1814, on the approach of the European armies to Paris, the Empress Maria Louisa and the council of regency repaired for a while to this place. Afterward the castle was entirely neglected and even used as barracks for cavalry. During the later years of Louis Philippe's reign, this curious specimen of architecture was carefully and tastefully restored. Blois has several literary and scientific societies, a botanical garden founded by Henry IV, a public library with 19,000 volumes, a departmental college and a diocesan seminary. It trades in wines, spirits, vinegar, staves and licorice, while it produces serges, hosiery and gloves, boots, shoes, biscuits, furniture, machinery, earthenware, cutlery and hardware, and there are tanneries, foundries and vinegar works. Pop. (1911) 23,995. Consult Le Nail, 'Le Château de Blois' (Paris 1874); Bournon, 'Blois, Chambord et les châteaux du Blésois' (Paris 1908).

BLOK, blōk, **Alexander Alexandrovich**, Russian poet and man of letters: b. Petrograd 1880. He is the son of Alexander Lev Blok, professor of political science at the University of Warsaw. He received his education at the University of Petrograd. His first poems ‘Novi Puti’ (‘New Roads’) and ‘Syeverny Tzveti’ (‘Flowers of the North’) appeared in 1903 and were exceedingly well received. Of his collective works the verses about the ‘Beautiful Lady’ (1905), ‘Snow Mask’ (1907), ‘Unexpected Joy’ (1907) announced a virile poet with an extremely compound soul. His lyric dramas ‘Balaganchik,’ ‘The King on the Market,’ ‘The White House,’ ‘The Song of the Fates,’ etc., showed a further development of his unusually vivid imagination. Blok's poetry represents something entirely new in Russian literature; his romantic lyricism has created new types, new shadows, a new world of sphinxes moving about during the white nights on the celebrated Nevski Prospect in Petrograd. His is often called by the contemporary critics a «somnambulant» or «lunatic» whose visions are different from those of any other ordinary mortal. However, his powerful verses, his unique figures of speech and his wonderful discovery of a new magic in the Russian language have deserved for him a high place in the contemporary history of literature. Yet his dramas lack action and the dialogues in them are not as sparkling as his lyric verses. They are often too superficial to be called dramas, for there is no *idée maîtresse* in them nor a cohesive unity of action.

BLOMFIELD, Charles James, English divine: b. Bury-Saint-Edmunds, Suffolk, 29 May 1786; d. Fulham, 5 Aug. 1857. He studied for the Church at Cambridge, where he took high honors; and after filling several curacies, and acting for a time as chaplain to the bishop of London, was presented to the rectory of Saint Botolph, Bishopsgate. In 1824 he was made bishop of Chester, and in 1828 bishop of London. He acquired considerable renown as a classical scholar from the editions published by him of several of the dramas of Æschylus, and he also published an edition of Callimachus, which is much esteemed. Along with Rennel, he edited, in 1812, the ‘Musæ Cantabrigienses,’ and in 1814, along with Monk, the ‘Posthumous Tracts’ of Porson, followed two years afterward by the ‘Adversaria Porsoni.’ In his ecclesiastical capacity he displayed great zeal and energy, more churches having been built in London under his episcopate than under that of any bishop since the Reformation. He incurred, however, some animadversions on his proceedings in relation to the Tractarian controversy by a vacillating policy, which gave satisfaction to neither of the parties. Consult the biography by Blomfield (London 1863), and that by Biber (ib., 1857).

BLOMFIELD, Edward Valentine, English clergyman (brother of the preceding): b. 14 Feb. 1788; d. 3 Oct. 1816. He studied at Caius College, Cambridge and excited the highest expectations. Among several prizes which he gained was a medal assigned him in 1809 for his beautiful ode ‘In Desiderium Porsoni.’ In 1812 a fellowship in Emmanuel College was conferred on him, those of his own college being full. In 1813 he visited Germany, where he acquired a good knowledge of the German language, and became acquainted with Wolf in Berlin, and Schneider in Breslau. After his return he wrote in the ‘Museum Criticum,’ or ‘Cambridge Classical Researches,’ remarks on German literature which were received with approbation. The University of Cambridge appointed him one of the preachers of Saint Mary's Church. He began a translation of Schneider's ‘Griechisch-Deutches Lexicon,’ but did not live to finish it. Matthiæ's ‘Griechische Grammatik,’ however, he translated completely. His translation was published by his brother and was everywhere well received. He was in Switzerland in 1816 with his pupil, a young nobleman, and in his haste to return to Cambridge on hearing that he was appointed proctor for the following year, the fatigue of rapid traveling occasioned a sickness of which he died.

BLOMFIELD, Reginald, English architect: b. 20 Dec. 1856. He was educated at Exeter College, Oxford. Among his many important professional works are ‘Brocklesby Park,’ ‘Caythorpe Court,’ ‘Holbrook House,’ ‘New Buildings at Haileybury College,’ ‘Lady Margaret Hall,’ ‘Portsea Institute.’ He has published ‘The Formal Garden in England’ (1892); ‘A History of Renaissance Architecture in England’ two works of great value (1897); ‘Short History of Renaissance Architecture in England’ (1900); ‘Studies in Architecture’ (1906); ‘The Mistress Art’ (1908); ‘Architectural Drawing and Draughtsmanship’ (1912).

BLOMMAERT, blŏm-märt, **Philipp**, Flemish philologist: b. Ghent about 1809; d. 1871. He did much for the literature of his country by an edition of the old Flemish poets of the 11th, 12th, 13th and 14th centuries, with glossaries, notes and emendations. He also republished the ‘Nibelungenlied,’ translated into Dutch iambics. His best work, however, is the ‘Aloude geschiedenis der Belgen of Nederduitschers,’ in which he vindicates the claims of his country to an independent national existence and national literature. Blommaert also wrote French well, and was a contributor to the *Messager des Sciences Historiques.*

BLOMMAERT, Samuel, colonial patroon: b. 1590; d. 1670. He bought of the Indians a tract of land almost equal in size to the present State of Delaware, extending from Cape Henlopen to the mouth of the Delaware River. The deed for this land given him by Peter Minuit and his Council at Fort Amsterdam in 1630 is the oldest deed for land in Delaware. He formed a company to provide for the settlement of this land, and a colony was started named Swaanendale, but destroyed by the Indians after a few years in revenge for an act of the governor, Gillis Hosset.

BLOND, Jacques Christophe le, German printer of engravings: b. Frankfort-on-the-Main 1670; d. Paris 1741. He studied in Italy and lived some years in Amsterdam as a painter of miniatures, and later of larger portraits. He then came to England. He conceived the idea of an establishment to print engravings in colors according to the Lostman method of copperplate reproduction of mezzotints, and, obtaining means, produced many copies of engravings and pictures, which of course had defects, and the experiment failed. He now devoted himself to producing the cartoons of Raphael in tapestry, but this failed also, and he soon after died miserably in a French hospital.

BLONDEL, a confidential servant and instructor in music of Richard Cœur de Lion of England, about the year 1190. While his master was the prisoner of the Duke of Austria, Blondel went through Palestine and all parts of Germany in search of him. He understood, it is said, that a prisoner of rank was confined in Dürrenstein Castle, and hastened hither. Placing himself under a grated tower, he began to sing one of the French lays which he had formerly composed for Richard. Scarcely had he finished the first stanza when a voice from the dungeon of the tower responded. Thus he discovered his King, returned with all speed to England, obtained Richard's ransom and gained the name of the «faithful Blondel.» Grétry's fine opera, 'Richard Cœur de Lion,' is founded on this anecdote. The earliest trace of this legend occurs in the 'Chronicle of Rheims' (13th century). No mention of it is found in Blondel's acknowledged poems (Vol. XIX of Tarbé's ed.), Collection des poçtes 'Champenois' (Rheims 1862).

BLONDEL, David (1596–1655), a noted French Protestant clergyman. In 1650 he succeeded J. G. Vosius in the professorship of history in Amsterdam. In this position he undertook deep researches. His works are many. In some of them he shows a remarkable critical faculty, as, for instance, in his dissertation on Pope Joan (1647-57) in which he came to the conclusion, now universally accepted, that the whole story is a mere myth. His keen critical sense and his power of deep thought made him iconoclastic in other directions, so that he excited considerable Protestant indignation, and became, for a time, very unpopular on account of this work on the Pope.

BLONDIN, blŏn-dăṅ, **Charles** (real name Jean François Gravelet), French acrobat; b. Saint Omer, Pas-de-Calais, 1824; d. Ealing, London, 22 Feb. 1897. He was trained at Lyons, where he made such rapid progress that he was designated «The Little Wonder.» After making a several years' tour of the United States, on 30 June 1859, before a crowd of 25,000 persons, he crossed the Falls of Niagara on a tight-rope in five minutes; on 4 July he crossed blindfold, trundling a wheelbarrow; on 19 August he carried a man on his back; on 14 Sept. 1860 he crossed on stilts in the presence of the Prince of Wales. His engagement at the Crystal Palace in 1862, where he performed on a rope 249 yards long and 170 feet from the ground, drew immense crowds. After several years' retirement he reappeared in 1880, and in 1888 again visited the United States. When the New York city authorities refused him permission to perform in Central Park, he gave a series of exhibitions on Staten Island, performing many extraordinary feats, such as carrying a stove to the centre of the line and making an omelet on it. Later in the same year he performed in London. His final performance was given at Belfast in 1896.

BLONDIN, Pierre Edouard, Canadian statesman: b. Saint François du Lac, county of Yamaska, 14 Dec. 1874. He was educated at the Seminaire de Nicolet and Laval University, Montreal, and was admitted a notary in 1910, and served as an alderman for Grande Mère. He was elected to the House of Commons for the county of Champlain in 1908 and became prominently identified with the Nationalist wing of the Conservative party; was appointed deputy speaker in 1911, Minister of Inland Revenue in 1914 and Secretary of State in 1915; Postmaster-General on 8 Jan. 1917, from which office he resigned 21 March of the same year in order to raise a French-Canadian regiment for service overseas. His resignation, however, was not accepted.

BLOOD, Thomas, English adventurer, better known as Colonel Blood: b. about 1618, probably in Ireland; d. Westminster, 24 Aug. 1680. He was the son of a blacksmith in easy circumstances; of his early life little is known, except that he took the Parliamentary side in the Irish rebellion. Having visited England about 1648, Blood married a Miss Holcroft of Lancashire and returned to Ireland. He was made a justice of the peace by Henry Cromwell and had large assignments of land as payment for his services and zeal. At the Restoration he was deprived of the lands and in reprisal he associated with such of the Cromwellians as were ripe for insurrection. Two of their designs were to surprise Dublin Castle and to seize the person of the lord-lieutenant, James Butler, Duke of Ormonde. Blood was at the head of these enterprises, planned for 9 or 10 March 1663. Betrayed by one of his associates, he managed to escape, although his chief accomplices were seized and executed. He made a bold attempt to rescue them. He eluded pursuit by fleeing to the remote mountain fortresses of Ireland and at last, when the danger became urgent, he quitted Ireland, and crossed to Holland, where he found a welcome among the disaffected sectaries. His daring spirit prompted him to return to England, where he associated with the Fifth Monarchy men. Seeing little chance for the furtherance of his schemes, he removed to Scotland and joined the Covenanters in their revolt, remaining with them till after the defeat at Pentland Hills in November 1666. Four years later Blood, with five companions, waylaid the Duke of Ormonde in Saint James street and tied him on horseback to one of the desperadoes. Nothing less was intended than to hurry the Duke to Tyburn, and there hang him in requital of his having hanged others. The Duke's attendants raised the alarm and rescued their master after he had unhorsed his riding companion and was struggling with him on the ground. On 9 May 1671 Blood made his great attempt to steal the crown jewels. Disguised as a clergyman and with three accomplices he entered the tower and succeeded in overpowering the keeper, Edwards, and in carrying off the jewels. They were immediately pursued, seized and thrown into jail. Instead of being executed for this attempt he met reward, being saved by his audacity. Blood refused to make confession except to the King himself, and Charles, at the suggestion of Buckingham, who was accused of having hired

Blood to make the attempt on Ormonde, visited Blood in prison. Blood threatened that his confederates would avenge his death, secured a pardon from Charles, together with his forfeited Irish estates of £500 annual value, and seemed to have interest at court, being often seen in the presence-chamber. Before long he quarreled with his protector, Buckingham, fell under accusation of conspiring to have him charged with an atrocious crime and was committed to prison. It is probable that it was a trick to ruin him. He found bail and returned to his home in Westminster. His health was broken and he died after an illness of 14 days. He was buried at Tothill Fields. Rumors being circulated that it had been a sham funeral to keep the living man hidden, his body was exhumed and identified. Scott introduces Blood in ‹Peveril of the Peak.› Consult Seecombe, ‹Twelve Bad Men› (New York 1896).

BLOOD, the bright red to very dark red alkaline fluid that circulates through the heart, arteries and veins, carrying nutriment and oxygen to the bodily tissues, and conveying away from them waste material. The composition and character of the blood varies very widely in different animals, and hence this description is confined more particularly to the human blood. From the standpoint of cell-structure the blood is a tissue made up of a liquid plasma and solid cells or corpuscles. It contains at least four separate and important ingredients, the plasma, or blood serum; red cells, or erythrocytes; white cells, or leucocytes; and blood plates. About one-tenth to one-twelfth of the entire body is blood, of which nine-tenths is water.

Plasma.— The greater portion (56 per cent) of the blood is plasma. This plasma is composed of 90 per cent water containing gases, mineral salts, fats, nitrogenous bodies and carbohydrates in solution. It is a clear yellowish fluid. The mineral salts are sodium chloride, common salt, the most abundant; sodium carbonate, which renders the blood alkaline; potassium chloride, potassium sulphate, calcium phosphate, sodium phosphate, magnesium phosphate and calcium chloride. Traces of other inorganic salts are frequently found. The gases in the blood plasma are oxygen, nitrogen and carbon dioxide. Of the organic constituents the non-nitrogenous ones are the fats and carbohydrates, with small amounts of fatty coloring matters, lipochromes, cholesterin and sarcolactic acid. The fats are present in variable quantities, being particularly abundant following a meal. They are the glycerides of stearic, oleic and palmitic acids. The carbohydrates are at least three, glycogen, dextrose, or grape sugar, and animal gums. The non-protend nitrogenous constituents of the plasma consist largely of the waste extractives. The most important of these are urea, kreatin, kreatinin, uric acid and hippuric acid. Three ferments or enzymes are thought to be present in the plasma — a diastatic ferment, converting starches into sugars; a glycolytic enzyme, breaking up sugar, and a lipase, or fat-splitting enzyme. In addition, there is the ferment that causes coagulation. Whether this is present in the serum or in the white cells is a matter of inquiry. The proteids of the plasma are serum albumins, globulins (serum globulin and fibrinogen) and nucleo-proteids.

Red Cells.— These are the most abundant of the formed elements of the blood, making up 99 per cent of the corpuscles. There are thought to be in man as least 5,000,000 red blood-cells to every cubic millimetre of blood; their size, therefore, is very small, averaging in man 7.8 m.mm. They are flattened circular discs, with double depressed centres, one-fourth as thick as broad. In the embryo and in certain diseased states the red blood-cells have a nucleus, but the normal red blood-cell in man has lost this cell structure. Practically all of the mammals, save the camel tribe, have circular red blood-cells; the camels and most of the lower animals have oval red blood-cells; in the lower animals they are mostly nucleated. There is also great variation in size in the red cells of the various animals, being largest among the *amphibia* (Amphiuma 75 m.mm.). The red blood-cells are mostly manufactured in the marrow of the long bones. The chemical structure of the red cells is complex, but they contain an iron compound, hæmoglobin, which is the most important constituent of the blood in the process of respiration and oxidation; by it the complex processes of chemical interchange in the body (metabolism) are made possible. Poisoning of the hæmoglobin and the loss of its function means death by asphyxia. The hæmoglobin gives the reddish-yellow tinge to the blood, and the differences in shade between the venous blood and arterial blood are due to the state of oxidation of the hæmoglobin.

White Cells — Leucocytes.— These are much less numerous than the red cells, varying in number from 5,000 to 20,000 to the cubic millimetre. At least five different forms of white cells are normally present in human blood. These are large and small lymphocytes, polymorpho-nuclear neutrophiles, eosinophiles and transitional forms. Mast cells are another form of varying occurrence. The polymorph neutrophiles are the most numerous of the leucocytes and make up the greater mass in pus-cells. In shape and size these white cells differ, but all are spherical, some smaller than the red cells (6.7 m.mm.) but mostly larger (about 10 m.mm.), and all have one or more nuclei. The leucocytes are formed in a number of lymphatic tissues, the hæmolymph glands, the spleen, etc., and are among the most interesting of the constituents of the blood, since one of their chief functions is to protect the body from disease-producing micro-organisms. They may be aptly termed the human body's «army of the interior» in the fight with disease-causing agents. They are useful both physically (by eating, as it were, the bodies of invading bacteria — phagocytosis, q.v.) or chemically (in the elaborating of certain counter-poisons — antitoxins, q.v.) or in the manufacture of specific immunizing bodies for the blood-serum. (See IMMUNITY). Their careful study in diseased conditions is very helpful in arriving at a diagnosis of the disease process.

Blood Plates.— These are of frequent occurrence, but as yet little is known of their function. They are thought to be globulin-like in their nature and of use in the phenomenon of coagulation; others claim them as nucleo-proteids, made from the white blood-cells.

Functions of the Blood.— These, as already indicated, are numerous. Through the hæmoglobin, blood is the great oxidizing medium. It carries products for anabolism and products of katabolism, and is the great equalizer, by arterial pressure, of the osmotic pressures of all the cells of the body. As a means of defense in the struggle with parasitic invaders the blood is the most important of the body's bulwarks. See ANÆMIA; BLEEDING; CHLOROSIS; CIRCULATION; HÆMOPHILIA; LEUCÆMIA; PERNICIOUS ANÆMIA.

Bibliography.— Bayliss, 'General Physiology'; Cabot, 'Clinical Examination of the Blood' (New York 1904); Ewing, 'Clinical Pathology of the Blood'; Schäfer, 'Physiology' (Vol. I, 1898); Starling, 'Human Physiology.'

BLOOD, Avenger of, in Scripture, the nearest relation of any one that had died by manslaughter or murder, so called because it fell to him to punish the person who was guilty of the deed. In the political law of Israel the practice of punishment by the nearest relative, which had always been prevalent, was allowed to continue, while rules were laid down to prevent the chief abuses connected with it. The distinction was sharply drawn between murder and manslaughter. For the former no ransom or satisfaction was permitted. In the case of the latter, however, there were six cities set apart out of the number which the Levites occupied, placed at suitable distances over the extent of the land, three on each side of the Jordan, with roads leading to them which were well kept up, and these were cities of refuge to which the manslayer might flee and within which he might dwell in safety without fear of the avenger. But he was not permitted to return to his own place; in fact, he had no safety, if he left his place of refuge, until the death of the high-priest during whose term of office his misfortune had occurred. See CITIES OF REFUGE.

BLOOD, Circulation of. The highly differentiated and marvelously regulated circulatory system in man furnishes striking evidence of evolutionary development in response to growing complexity of environmental demands. Unicellular animals and the lowest metazoa obtain from the surrounding fluid in which they live oxygen and nutritive material and excrete waste materials into it directly, the whole surface performing these functions. The movement of the fluid is maintained by the movements of the cell or body of the animal itself and by the influence of nutritive absorption. In the Polypi the movement receives aid besides from the action of cilia on the inner walls of the body. The division of physiological labor in the more complex and differentiated metazoa requires a special circulatory mechanism and a fluid which contains more specifically respiratory and nutritive elements. Therefore in the three-layered animal a circulatory system was evolved within a celom or body cavity. The fluid within this cavity is still, however, in some coelenterates merely water containing organic elements, but this gradually acquires a greater diversity of elements making for coagulability, more complete respiratory function and better fitting it for supplying varying tissues in their nutritive and excretory needs. It is only, however, in the vertebrates that the blood exhibits a constancy of composition and circulates in a completely closed system. Birds and mammals alone have reached a complete separation of the arterial and venous blood. The *Arthropoda* and *Insecta* have a circulatory system which consists of a pulsating heart which sends its current through the arteries into open spaces or lacunæ within the body cavity where the blood and tissues directly interchange their contents. The muscular movements of the body help to return the blood into a venous sinus from which it reaches the heart by slitlike apertures in the latter provided with valves. During its course the blood passes through the renals and gills. Capillaries are found instead of the lacunæ in the annelids, as the earthworm. The *Mollusca* have the heart provided with an auricle and a ventricle, as in the snail and whelk; two auricles, one on either side of the ventricle, as in the fresh-water mussel; or two auricles and two ventricles, as in the ark shells. Among the ascidians, which stand low in that division of animals to which the mollusks belong, the remarkable phenomenon is encountered of an alternating current, which is rhythmically propelled for equal periods in opposite directions. All vertebrated animals, except *Amphioxus,* have a heart which in most fishes consists of an auricle and a ventricle, but in the mud fishes (*Lepidosiren*) there are two auricles and one ventricle; and this trilocular heart is found in the amphibians and in most reptiles except the crocodiles, which, like birds and mammals, have a four-chambered organ consisting of two auricles and two ventricles. In the crocodiles, however, the two blood streams are not yet wholly separated because of a communication between the right aorta containing arterial blood and the left aorta containing venous blood. In the trilocular hearts the two currents are mixed in the single ventricle but a separation is gradually established by the extension of the ventricular septum which finally completely divides the ventricle.

History.— The correct knowledge of the circulation of the blood in the human organism dates from the investigations and discoveries of Harvey published in 1628. In reality the discovery of the circulation was a gradual accretion but it was Harvey who finally placed this knowledge upon an accurate basis, removing certain mistaken theories which were still accepted and demonstrating at last the circulatory process. Galen's physiological teachings had long held sway even though they had come to be considerably modified. This ancient physiologist distinguished, as others had already done, arteries from veins and exploded the still older theory that the arteries contained air. The veins, he believed, had their origin in the liver, proceeding from it in two great trunks; the portal vein carrying to the liver the food absorbed from the alimentary canal which was there converted into blood containing nutritive «natural spirits,» and the vena cava which divided into an ascending and a descending branch. The blood was carried to the right side of the heart where communicating pores in the septum united the two ventricles and where the action of the innate heat of the heart and the air obtained through respiration united to produce the «vital spirits» which make the blood fit for higher functions. The veins further carried the crude blood in an ebb and flow from the right side of the heart for the lower nutritive functions, while similarly the purer arterial blood from the left side supplied to the tissues their vital functions. From this arterial blood in the brain «animal spirits» were elaborated which were carried along the nerves to produce movements and the highest functions of the body.

This is the outline of the crude Galenic doctrine, and Vesalius, brilliant anatomist that he was, was content to accept it, although there are evidences that he was very skeptical regarding much of Galen's physiological teaching. It was particularly from the anatomical side that he was most skeptical; namely, because of the lack of tangible holes between the two sides of the heart, which were so important to the Galenists. His skepticism was taken up by his pupils and was also felt by others, one of them, Michael Servetus, who published a remarkable book, the 'Restitutio Christianismi,' in which a much truer conception of the circulation of the blood was taught. This was as early as 1553. He rejected entirely the ancient doctrines and had grasped the true doctrine of the pulmonary circulation, the passage of the blood from the right side through the lungs to the left side. Servetus, however, was a theologian more than a physician and his early death probably prevented his further studies. Realdus Columbus, of Cremona, must be regarded as another link in the chain that led up to the final solution. He is thought to have been a tricky man, however, and one who would not hesitate to poach on another's preserves, and there are indications of his copying much from Vesalius' works and claiming them as his own. He was vain and ignorant, but in his book, 'De Re Anatomica' (1559), he described correctly the plumonary circulation, but he was unable to draw from it the lessons that it implied. This, by many historians, is taken as evidence that he was only a copier, and that probably the work of Servetus had been seen by him and he had claimed the discovery as his own. Cæsalpinus, a noted botanist, was the first to appreciate the fact that on the contraction of the ventricles (systole) the blood was thrown into the aorta and into the pulmonary artery, and at its diastole it received the blood from the vena cava and the pulmonary vein. He also seemed to have grasped the fact of the flow of the blood from the arteries to the veins and of the flow along the veins to the heart. This was in 1571 and 1593. Thus Cæsalpinus had a true suggestion of the idea both of the pulmonary and systemic circulations. But Cæsalpinus' work seems to have been lost sight of, and another, Hieronymus Fabricius, had the honor to open the next door that led to Harvey's triumph. Fabricius called renewed attention to the valves in the veins, but missed their real function, and, although he was Harvey's teacher, he was more of a Galenist than a modern.

It is to William Harvey's credit, not so much that he was the discoverer of the physiology of circulation,— this, it can be seen from this brief recital, was of gradual accretion,— but that he was the first demonstrator of the process. He was the first physiological experimenter, and his work on the living animal has opened up to the world most of its priceless gifts in the field of medicine. It was by the faithful and prolonged study of many hearts of many animals that showed him that —

> "the motion of the heart consists in a certain universal tension, both of contraction in the line of its fibres, and constriction in every sense, that when the heart contracts it is emptied, that the motion which is in general regarded as the diastole of the heart is in truth its systole";

— that the true work of the heart is not that it sucked blood in, but that it drove blood out. Cæsalpinus guessed at this, or may be knew it, but Harvey proved it, and, what is more, read the consequences. He saw clearly, then, the real function of the auricles and the ventricles and of their valves, and he applied the lessons of the lesser, or pulmonary circulation, to the greater, or systemic circulation, and thus rounded out the true natural history of the process. In his own words:

> "I frequently and seriously bethought me, and long revolved in my mind, what might be the quantity of blood which was transmitted, in how short a time its passage might be effected, and the like; and, not finding it possible that this could be supplied by the juices of the ingested aliment without the veins on the one hand becoming drained, and the arteries on the other hand becoming ruptured through the excessive charge of blood, unless the blood should somehow find its way from the arteries into the veins, and so return to the right side of the heart, I began to think might there not be *a motion, as it were in a circle.* Now this I afterward found to be true; and I finally saw that the blood, forced by the action of the left ventricle into the arteries, was distributed to the body at large, and its several parts, in the same manner as it is sent to the lungs, impelled by the right ventricle into the pulmonary artery, and that it then passed through the veins and along the vena cava, and so round to the left ventricle in the manner already indicated, which motion we may be allowed to call circular."

Thus clearly and forcefully he set forth in 1616 — although his work did not appear until 1628 — the true doctrine, and it is of interest to record that he lived to see it adopted practically by all scientists. Malphigi, in 1661, demonstrated, by means of the microscope, the capillaries, thus filling out the last link in the chain of evidence.

Mechanics of Circulation.— The closed circulatory system in man consists of the heart, arteries, capillaries and veins. The heart is a muscular pump which beats regularly about 72 times a minute, thus forcing the blood with considerable velocity and force through the arteries and capillaries and back through the veins to enter the heart once more and so complete the circuit. The mammal heart, as we have seen, has become a double organ and each side consists of two chambers, the auricles and ventricles.

The auricles are the smaller, less muscular portions of the heart, since their function is merely to receive the blood and transmit it to the ventricles. The walls of the left ventricle are four times the thickness of those of the right ventricle, since upon the left ventricle falls the work of propulsion for the entire systemic circulation, while the right ventricle has but to send the blood through the pulmonary vessels. The direction of the course of the blood through the heart is maintained by the presence and arrangement of valves which guard the orifices between auricles and ventricles and the opening of the aorta and of the pulmonary artery. The tricuspid valve, consisting of three flaps of fibrous tissue, guards the right auriculo-ventricular opening, and the bicuspid or mitral valve, consisting of two flaps, guards the left. Near the base of attachment these flaps are tough and able to withstand the pressure of the blood, while at the edges they are thin and delicate and yield to the force of the current. When the blood has passed into the ventricle they form by their perfect apposition an effective guard against return of the blood to the emptied auricle. The muscular attachments of the valves at the same time extend the diaphragm formed by their closing into the ventricle sufficiently to contract the ventricular chamber and so assist in expelling the blood. A backward eddy of the blood in the ventricle maintains the closure of the valves. Similar arrangement guards the proper closure of the aortic and pulmonary valves.

There are in reality two circulations, the pulmonary and the systemic. The dark, venous blood returned from the circuit through the body, the systemic circulation, where it has become charged with waste products and other impurities is poured into the right auricle. This contracts, the tricuspid valve opens and the blood is discharged into the right ventricle. Here it remains a small fraction of a second, when this ventricle contracts, the tricuspid valve closes and the blood is driven through the pulmonary artery into the lungs where it is spread out through the millions of capillaries distributed throughout the lung tissue. Here it is freed from its carbon dioxide, oxygenated and then returned through the pulmonary vein into the left auricle. The contraction of the left auricle discharges this oxygenated blood through the mitral opening into the left ventricle, whose powerful contraction sends it into the aorta to perform its systemic circuit, which distributes it to the arteries supplying all parts of the body by their continuation through the arterioles which end in turn in the capillaries distributed throughout all the tissues. Here the blood through the thin capillary walls comes into contact with the intermediary fluid known as the lymph, which fills all the tissue spaces through which by osmosis an interchange takes place. The blood exchanges its oxygen and nutritive elements for the waste matter of the body and effects that transference of chemical substances from the organs in which they are produced to those others in any way depending on their activity. This includes the transmission not only of the elaborated products of digestion but likewise the internal secretions or hormones, the importance of which is coming to recognition. From the capillaries, after exchange of products with the tissues through the lymph has taken place, the blood is collected by venules into the veins, which finally unite into the vena cava which carries the blood back to the right auricle. The contraction of both sides of the heart is a simultaneous one. It consists in reality of a wave of contractions passing over the heart muscle, the period of contraction being known as the systole, while the intervening period of rest and relaxation is known as the diastole. The complete cycle of contraction and relaxation with the circulation of the blood through the body occupies about 22 seconds, and occurs in the adult normally about 72 times in a minute. The audible sound on examination is due to the closing of the auriculo-ventricular valves and those at the entrance of the aorta and pulmonary artery. The pulse which can be felt in various superficial localities is due to the expansion of the distensible arterial walls. The elasticity of the arterial walls is an important factor in regulating the original force of the blood flow. Their distension changes the intermittent propulsive flow into a more steady current, while their ready contractility after distension regulates the distribution of the blood stream to the various organs. Pressure is gradually diminished until in the veins there is merely a uniform flow of the returning blood. The contraction of the heart muscles is due to a series of complicated nervous mechanisms. The heart musculature manifests in its arrangement its development from an original muscular tube which, while it has been modified into the separate chambers of the mammalian heart, has yet retained its continuity in the band of muscular fibres discovered by His (auriculo-ventricular bundle) which allows the contraction impulse to proceed successively from the root of this bundle in the right auricle to the ventricles. The excitation of the heart muscle seems to be due to the molecular concentration of the fluid which bathes the tissue. The heart is also under the control of a special innervation which adapts it to conditions of the organism and to changes in the arterial resistance. The vagus nerve from the medulla oblongata exercises an inhibitory function while sympathetic fibres running from the upper dorsal region of the spinal cord exercise a stimulatory function. Sensations arising in the heart are carried through the sympathetic ganglia and the upper thoracic region of the spinal cord where they are referred to the sensory nerves of adjacent regions with which they come into relation, so that cardiac pain is not recognized as such but as sensation in these regions. The walls of the blood vessels are also richly supplied with nerves which regulate their tonicity and thus adapt them to the changing conditions of the body organism. These are the vasomotor nerves and consist of the vasoconstrictors which exert a tonic effect and bring about a contraction of the vessels and the vasodilator nerves, which as the name implies dilate the vessels. The heart has its special system of blood supply in the coronary vessels, the blood entering the coronary arteries from the aorta and passing into capillaries which surround all the fibres. See ARTERIES; BLOOD; BLOOD PRESSURE; CAPILLARIES; HEART; VEINS.

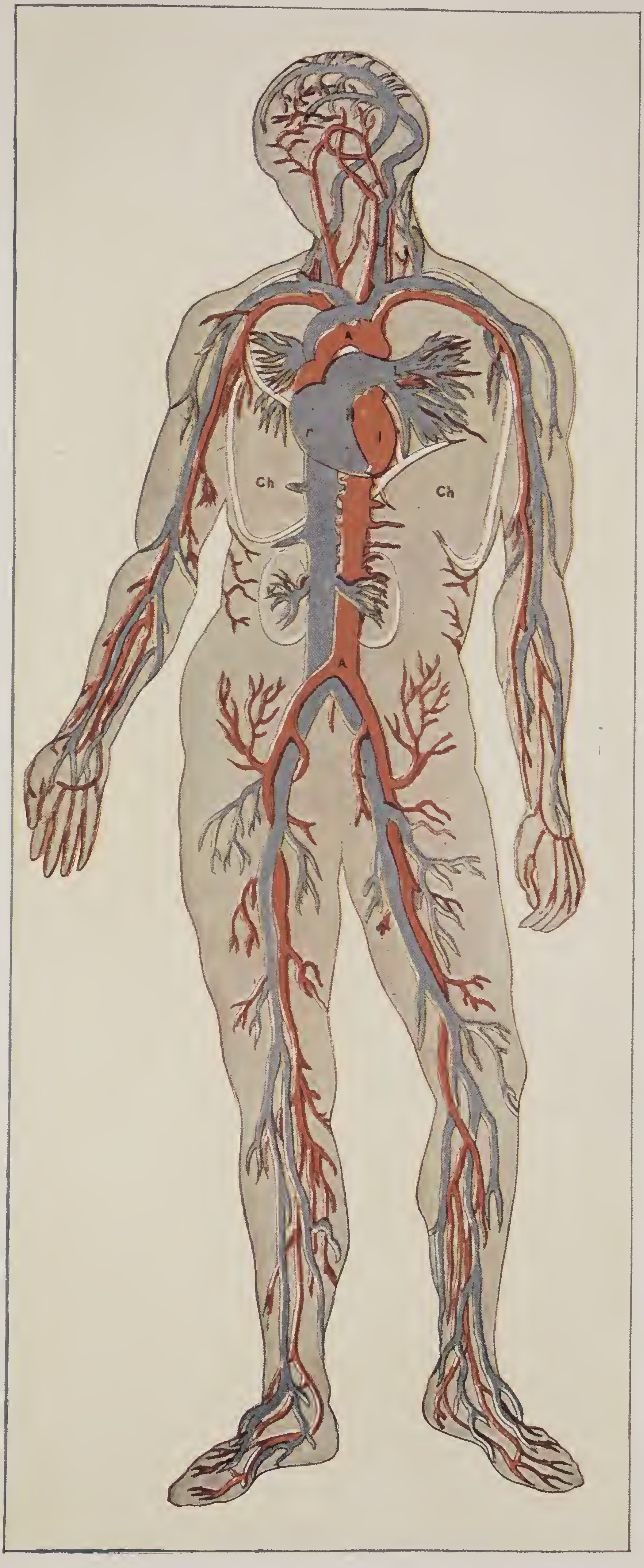
SMITH ELY JELLIFFE.

BLOOD, Council of, the name popularly applied to the Council of Troubles, established by the Duke of Alva, in the Netherlands, in 1567. Although it had no charter or authority from any source, it was omnipotent and superseded all other authorities. In the first three months alone its victims numbered 1,800, and soon there was hardly a Protestant house in the Netherlands that had not furnished a victim.

BLOOD, Diseases of the. Blood is a very complex substance, it is even called a tissue. It has two essential parts, the plasma, composing 60 per cent, and the corpuscles, 40 per cent: the latter are not in solution but

BLOOD.—The General Distribution of the Blood Vessels.

Arteries are shown in red, the veins in blue.



H, the heart. l, left side. r, right side. Arising from the heart is the main artery, Aorta (A). The letter is put on the vessel at some distance from the heart, near where it gives off the branches (in red) for the head and arms, and at the point where it arches backwards and downwards to pass through the chest and the belly till at A, it gives off branches for the legs. Running alongside the arteries are represented in blue, veins. At K, is represented the position of the kidneys and their veins. L, represents veins of the lung. J, jugular vein. Ch. outlines of the chest.

are floating about. Plasma containes 90 per cent water, albumen, fat, mineral salts, also at times peptone or digested food and sometimes parasites and bacteria. Corpuscles or blood-cells are red and white, the latter to the former as 1 to 300. There are 5,000,000 or more per c.m. of the former, 10,000 to 20,000 of the latter. When the blood clots, the clot contains corpuscles and fibrin, the serum which is squeezed out contains the remainder.

Disease of the blood may exist from too much or too little of any of its elements, also from the presence of elements which are foreign to it. It is possible for the blood itself to be in such excess as to constitute the diseased condition called plethora. Full-blooded people have very red skin, are often stout, bleed easily and freely and are subject to apoplexy. They are often benefited by the loss of a few ounces of blood and the observation of that fact doubtless led to the custom of bleeding as a remedial measure. For a long time it was used so irrationally that its valuable features were obscured, and for years it was practically abandoned as a therapeutic measure.

The albumen is decidedly the most important constituent of the plasma for it furnishes food for the cells. This may be deficient or it may pass through the kidneys in large quantities as in Bright's disease. Sugar is one of the products of the chemistry of the body but it is alien to the blood and when it circulates with the blood the disease called diabetes is present. Fat may be in the blood in sufficient quantity to constitute the disease known as lipæmia. Fat is normally in the blood in two to four parts per thousand. During digestion and just afterward it is more abundant than at other times. In the condition of lipæmia it can be seen on the surface of blood which has been drawn. The mineral salts may be deficient or excessive, the former when one has been deprived for a long time of chloride of sodium or of food which contains it. It is possible for the watery elements of the blood to be excessive either actually or relatively. It is then commonly said that the blood is too thin, the condition being one of hydræmia and the indication is to increase the corpuscles or blood cells, particularly the red ones. This is a form of anæmia, and so is the condition called oligæmia when the actual volume of blood is too small, which is the situation after every severe hæmorrhage, or even after a profuse and persistent diarrhœa. It is the condition which always exists in the different forms of cholera.

The corpuscular elements of the blood are subject to many forms of disease which may be grouped in general under the term anæmia. When the red corpuscles are deficient after severe hæmorrhage or malarial poisoning or cancer or many forms of sickness there is great pallor of the skin and the condition is specifically oligocythæmia. Sometimes, especially in young girls, the skin has a greenish cast, this condition being known as chlorosis or the green sickness; it is not uncommon at the age of puberty. If the anæmia becomes very profound, going on usually to a fatal issue and the red corpuscles are reduced to perhaps a tenth of their usual number, it is called pernicious anæmia. Besides decrease in the number of corpuscles there may be diminution of the substance which is essential and vital to the red corpuscles because it carries the life-giving oxygen, and which is called hæmoglobin. The condition in this instance is known as oligochromæmia. Changes may also take place in the shape and size of the red corpuscles in various forms of disease, many of them may be very large or very small or crenated or dentated, or they may have nuclei which is extremely unusual for red corpuscles, or they may undergo destruction as in serious burns and in various kinds of poisoning. When this takes place and the liberated hæmoglobin circulates in the blood we have a condition known as hæmoglobinæmia. The white corpuscles are also very susceptible to change and to disease. In suppurative processes they are greatly increased in number, the condition being known as leucocytosis. In the very serious disease known as leucæmia or leucocythæmia their number is very greatly increased, so that their ratio to that of the red corpuscles instead of being 1 to 300 may be as high as 1 to 20. When the white blood cells are greatly diminished in number the condition is known as leucopenia.

The coagulating property of the blood may also be at fault and constitute disease. It has already been stated that the clot contains corpuscles and fibrin, the latter being the product of constituents within the blood which are not brought in contact so as to produce fibrin and a clot until there is some injury to the inner wall of a blood vessel or the blood is arrested in its course or until it is discharged from a vessel or vessels into the tissues or cavities of the body or outside the body. There are persons called bleeders in whom the constituents of fibrin do not exist in proper proportion or proper quantity and when bleeding takes place it is almost impossible to stop it because a clot does not form. Such persons may lose their lives from the smallest injury like the pulling of a tooth or a scratch of the finger.

Disease may be present from extraneous or abnormal elements in the blood like metallic poisons of various kinds, waste matters, foreign bodies consisting of particles of various substances. If there is black coloring matter the condition is melanæmia, acetone in connection with diabetes produces acetonæmia, bile circulating in the blood causes cholæmia.

A very important and serious condition is known as uræmia when waste material which should be excreted through the kidneys, as urea, is retained in the blood. Uræmic convulsions result fatally in the majority of cases. In ammonæmia ammonia is absorbed into the blood from the decomposed urine in the bladder.

Lithæmia indicates the presence of lithates in the blood in diseases like rheumatism. A disease of the blood once very common, but now less common because of the practice of antisepsis, is pyæmia when pus circulates freely in the blood current.

In septicæmia we have a general term for blood poisoning from almost any source but particularly from infectious material. We may have infectious germs of various kinds in the blood. One of the most important tests of the blood, the Wassermann test, is for determining the presence or absence of the germ of syphilis. Many other tests of the blood have been devised for determining the presence or absence of various diseases. There are also many parasites to be found in the blood, the plasmodium of malaria, the filaria sanguinis hominis, the distomum hæmatobium, the trichina, the organism of the sleeping sickness, etc. This portion of the subject is still undergoing active investigation and many important facts relating to the physiology and pathology of the blood are being brought to light. Consult Gannett, ‘Pathology of the Blood’ (Wood's ‘Reference Handbook of the Medical Sciences’).

Andrew F. Currier, M.D.

BLOOD BAPTISM. In the early Christian Church an unbaptized person who suffered martyrdom on account of the faith was held to have been baptized into that faith by a baptism of blood. It was also held that several passages of the Scriptures supported this doctrine as, for instance, Matt. x, 39; Luke xii, 50. As baptism was thought pretty generally to be an essential for a passport to Heaven, martyrdom was held to be a full substitute for it in this and all other respects.

BLOOD BROTHERHOOD. There were two ways of entering into the ancient totem clan — by birth and by initiation. But both of these requisites could be satisfied artificially by means of the transference of blood from the body of the candidate for admission into the clan, into the veins of several members of the clan, and, vice-versa from their veins into those of the candidates. This was supposed to actually supply or make, in the applicant, a community of blood with that of his chosen relations, the members of the new clan. This infusion was effected by making cuts in the arms and joining the bleeding parts. Sometimes each party sucked the blood from the wound of the others. Still another method was to mix the blood of all and then all partook of the mixture. A very symbolical method was employed when some animal was sacrificed with all due religious ceremony and the parties to the blood contract drank the blood of the slaughtered beast. Such a union has been called «blood brotherhood.»

BLOOD CLAM, or **BLOOD QUOHOG,** a local name given in Narragansett Bay to *Arca* or *Scapharca, transversa,* a common bivalve ranging from Narragansett Bay to Georgia, in reference to the reddish spots on the inside of the edge of the shell, and to the reddish flesh-color of the ovaries. It is not used as an article of food.

BLOOD FEUD, the right of individual, or family, vengeance in cases of bloodshed. In a very primitive state of society the tendency toward private instrumentality in the punishment of crime is largely unchecked. In passing from this stage to the highly organized system of legal penalties enforced by modern civilized governments, the regulation of the blood feud was a marked step in the advancement of the race. It is true that the right of private vengeance was recognized, but it was put under restrictions and gradually narrowed in its action. The slayer had the right of sanctuary, illustrated by the cities of refuge in Israel under the Mosaic economy, by the altars of pagan deities and by the churches of the Middle Ages. The danger of dragging entire clans into retributive warfare to avenge a single murder was averted by limiting the right of vengeance to the immediate family, or the next of kin to the one slain, and the privilege of purchasing exemption by the weregeld tended to check a blood penalty. The acceptance of the blood-money was finally made obligatory. The amount of the fine imposed upon the murderer varied among the Anglo-Saxons according to the rank of the victim. The family feuds among the mountain whites in certain sections of the United States form an interesting modern instance of the survival of the primitive institution of blood feud. See Asylum, Right of; Avenger of Blood; Cities of Refuge and consult Jenks, ‘Law and Politics in the Middle Ages’; Maine, ‘Ancient Law’ (London 1905); ‘Lectures on the Early History of Institutions’ (6th ed., London 1893); Pollock and Maitland. ‘History of English Law’ (2d ed., Boston 1899); Stephen, ‘History of the Criminal Law of England’ (London 1883).

BLOOD-FLOWER, or **BLOOD-LILY,** a genus (*Hæmanthus*) of about 60 species of summer- and autumn-blooming bulbous-rooted plants of the family *Amaryllidaceæ*, natives mostly of south Africa, named from the general color of their flowers, which are arranged in umbels arising on an often beautifully colored scape either before the foliage or from a rosette of radical leaves. The few species cultivated in American greenhouses have not become widely popular, but are worthy of more extended culture, since the individual flowers are often two inches in diameter and the umbel sometimes a foot across. They may be cultivated like the nerine. Since some of the most attractive species reproduce slowly, the bulbs are often cut in two horizontally and treated like hyacinth bulbs similarly cut. Several new bulbs form around the margin of the cut halves. Consult Bailey, ‘Standard Cyclopedia of Horticulture’ (1915).

BLOOD INDIANS, or **KINO INDIANS,** a tribe of North American Indians of the Siksika Confederacy, dwelling in the Northwest Territories of Canada.

BLOOD AND IRON: a phrase used by Bismarck in the Prussian House of Delegates in a speech on the Constitution, 30 Sept. 1862: «Nicht durch Reden und Majoritätsbeschlüsse werden die grossen Fragen der Zeit entschieden — das ist der Fehler von 1848 und 1849 gewesen — sondern durch Eisen und Blut.» «Not by speeches and majority resolutions will the great questions of the time be decided — that was the error of 1848 and 1849 — but by iron and blood.» (In the course of the same speech he said: «We are perhaps too cultured to endorse a Constitution. . . .». In his *Declamationes* Quintilian uses the phrase, «sanguinem et ferrum,» whilst the German poet Arndt (d. 1860) declared that the «brave proclaims himself master of the lands — with his iron, with his blood.»

BLOOD-LETTING. See Bleeding.

BLOOD-LILY. See Blood-flower.

BLOOD-MONEY, money paid to the next of kin of a man who met with his death at the hands of another, accidentally or with premeditation. The Greeks called it ποινή, the

Latins *pœna,* the Franks Allemanni and Scandinavians *manbote, wehrgeld* or *wyrgilt,* the British Celts named it *saarhard* and the Irish Celts *eric.* The institution still flourishes in many communities of Asia and Africa. In English criminal law the term blood-money was also applied to rewards paid to informers against highway robbers, thieves, burglars and utterers of false coin or forged bank-notes. Laws empowering such payments were passed between 1692 and 1742. In 1813 the total amount paid in this way was £18,000. By this time a number of persons made a living out of these laws by entrapping unwary and foolish people into the commission of the crime of forging or uttering false coin and then informing against them. As early as 1756 one McDaniel had brought to the scaffold and earned the blood-money of no less than 70 victims. Parliament, recognizing the abuses the system had engendered, repealed all the laws relating thereto, except in relation to the forgers of bank-bills, in which case the informer can still get his pecuniary reward. See AVENGER OF BLOOD; BLOOD FEUD; OUTLAWRY.

BLOOD-PHEASANT, one of the small quail-like pheasants of the Himalayan genus *Ithagenes,* whose throat and breast are blood-red. See PHEASANT.

BLOOD-POISONING. From the standpoint of bacteriology blood-poisoning may be of two distinct types. It may be due to the presence of the poisonous toxins taken up by the blood, in which case it is called bacteriæmia or sapræmia, sometimes septicæmia; or it may result from the toxins plus the micro-organisms in the blood itself, a true blood infection, in which case it is termed septicæmia or pyæmia. The bacteria most frequently found in the blood in cases of septicæmia or pyæmia are the *Streptococcus pyogenes aureus, Staphylococcus pyogenes aureus, Diplococcus lanceolatus,* in pneumonia; *Bacillus typhosus,* in typhoid, and occasionally others. See PYÆMIA.

BLOOD PRESSURE. This term refers to arterial tension or to the pressure of the blood in the blood vessels. It depends upon the cardiac strength, the peripheral resistance, the elasticity of the vessel walls and the volume of blood. Three factors are to be considered — the maximum or systolic pressure, the minimum or diastolic and the difference between maximum and minimum or pulse pressure. The pressure is indicated by the height of a column of mercury in a capillary tube or by air pressure upon a spring. The former method is altogether the more reliable, the air machines requiring correction from time to time by comparison with a mercurial apparatus. The apparatus is called a sphygmo-manometre, which signifies measurer of the pulse.

Measurement of the pulse or blood pressure is a procedure of comparatively recent recognition. Its importance was observed in Europe as early as 1828 but it was not until 1876 that the first sphygmo-manometre was made in this country, being that of Marey, which for a considerable period was used principally in physiological investigations and experiments. The second period began in 1896 with the apparatus of Riva-Rocci, which consists of an inflatable rubber bag or cuff, five centimetres in width, surrounded by a band of firm cloth which is wound around the arm. To this is attached a rubber tube connected with a reservoir of mercury, from which proceeds an upright glass capillary tube by the side of which is a wooden scale graduated in millimetres. The rubber bag is placed over the brachial artery above the bend of the elbow, secured by the band wound around the arm and inflated by means of a rubber bulb and tube until the pulse at the wrist has disappeared. As soon as the column of mercury comes to a rest, the point on the scale is noted and this is the maximum or systolic pressure. The air in the bag is then gradually released until the pulse clearly reappears and this becomes the minimum or diastolic pressure.

Many mercurial manometres have been devised since Riva-Rocci's, but they are only modifications of his. Among the mercurial instruments which are worthy of mention and reliable are those of Cook, Stanton, Janeway and Nicholson. One modification, and an important one, too, consists in a larger and wider cuff, and they are now made from 12 to 14 centimetres in width. Less than this width gives unreliable readings, especially in the upper register. The connections in any apparatus should be of non-distensible rubber tubing. The instrument must register both systolic and diastolic pressure, should not require more than two or three minutes for the operation, should be as light and compact as possible and not too expensive. The expense of most of the instruments has been such that many physicians have been disinclined to buy and use them and so familiarize themselves with an important means of diagnosis.

In examining for blood pressure it is well to have the patient in the sitting rather than the reclining position. The cuff should be applied at the level of the heart and therefore upon the brachial artery above the elbow. The cuff must be bandaged loosely about the arm to permit free inflation of the rubber bag. Breathing should be natural, as deep breathing raises the pressure during expiration and lowers it in inspiration. The cuff being adjusted and the valves of the apparatus open or closed as may be required on the machine which is being used, the bulb for pumping the air upon the reservoir of mercury is compressed and the mercury forced into the capillary tube. When the rubber bag has been sufficiently dilated to obliterate by its pressure the column of blood in the brachial artery, which is indicated by the disappearance of the pulse at the wrist, the column of mercury in the capillary tube is to be noted when it comes to a rest and the reading taken from the scale at its side. This is the maximum or systolic pressure. The air in the bag is then slowly released and when the pulse reappears and becomes regular again this will be the diastolic pressure. The difference between the two is the pulse pressure. This is the method by palpation, the finger of the physician being kept constantly at the site of the radial artery.

If the auscultation method is used, the rubber bag is inflated as in the palpation method until the pulse at the wrist is obliterated, after which the bell of an ordinary binaural stethoscope or the disc of a phonendoscope is placed over the artery at the elbow. The air pressure is then gradually released and when the cardiac beat first passes the constricting cuff it is announced by a loud sound which is the systolic pressure. As the pressure in the inflated bag is released this sound is followed by a murmur and then by a second sound which gradually disappears. At this instant the column of mercury shows the diastolic pressure.

The theory is that the blood pressure in the aorta which is at the maximum when it receives its charge of blood from the left ventricle is sustained as the blood goes through the arterial system, then as it is forced through the capillaries the pressure is reduced to its minimum and becomes the diastolic pressure. The blood pressure depends upon the contractile force of the heart and the peripheral resistance to be overcome, the latter depending upon the contractility and distensibility of the walls of the blood vessels. A weak heart necessarily will not have as high tension as a strong one, the time between the systoles will be shorter and the pulse pressure will be lower. A strong heart will have a longer interval between the systoles and a higher blood pressure. The pulse pressure is the most important factor with reference to treatment of the heart and in differentiating a cardiac from a vascular origin of a given condition.

Many important facts relating to blood pressure are now available; some of them are the following: The standards of blood pressure vary in different individuals, in health as well as disease; in women the standard is 10 millimetres lower than in men. The lowest recorded systolic pressure is 40; the lowest in which the patients have recovered are from 60 to 75. The systolic pressure, pulse pressure and pulse rate are increased after eating. The systolic pressure is lowered during sleep; the pulse pressure is increased by exercise and lowered by fatigue. Emotions and mental effort cause rise in diastolic pressure. It is better to take the pressure between meals. In conditions of disease the pressure may be high or low, continued high pressure meaning cardiac hypertrophy, changes in the arterial wall and danger of rupture. In arterio-sclerosis the pressure is high, often the systolic is from 150 to 250 and the diastolic 110 to 130. In nephritis there is often a systolic pressure of 200 and a low diastolic, with danger of apoplexy. During an attack of uræmia the blood pressure is high and falls when the conditions improve. In cases of high intra-cerebral pressure the blood pressure may be as much as 300 to 400. At the end of pregnancy the pressure is somewhat higher than normal and should eclampsia or other toxæmia occur it would mount to a great height.

Diseases which have low blood tension are pulmonary phthisis, cancer, syphilis, diarrhœa, peritonitis, etc. From the foregoing it will be apparent that much valuable information can be obtained by the general practitioner, or, indeed, by any physician, from records of blood pressure, particularly with reference to diagnosis and prognosis. Janeway, who has probably investigated the subject with as much care as anybody in this country, is quoted as saying that blood pressure should always be taken at the first examination of all patients and at occasional intervals in cases of cardiavascular disease and nephritis. It should be a routine practice in examinations for life insurance and athletic contests and it is desirable in obstetric, medical and surgical conditions in general. Consult Cook, H. W., 'Blood-pressure in Prognosis' (*New York Medical Record*, 1 Nov. 1911); Nicholson, P., 'Blood-pressure' (Sajous Analytical Cyclopedia of Practical Medicine, 7th ed., 1913); Janeway, T. C., 'When Should the General Practitioner Measure the Blood-pressure?' (*Medical Annals*, Albany, N. Y., March 1911).

Andrew F. Currier, M.D.

BLOOD-RAIN, showers of grayish and reddish dust, mingled with rain, which occasionally fall, usually in the zone of the earth which extends on both sides of the Mediterranean westwardly over the Atlantic and eastwardly to central Asia, the red color being due to the presence of organisms containing a red oxide of iron. These organisms sometimes impart a pink or reddish tint to snow. Black fungus sometimes gives rise to black rain in a similar manner. Such fungi and low plant forms grow usually in ponds in the Torrid Zones; the ponds are dried up for the greater part of the year. From these basins the fine dust and fungi are raised by the wind and carried many miles. A decrease in temperature causes rainfall, when the particles are carried to earth. See Rain.

BLOOD OF OUR SAVIOUR, an order of knighthood, known also as the Order of Our Redeemer, and the Precious Blood of Jesus Christ. It was instituted in Mantua, Italy, in 1608, by Duke Vincenzo Gonzaga and consisted of 20 members. Upon the collar was the legend *Domine probasti me*, and on the pendant *Nihil isto triste recepto*. The name originated in the tradition that certain drops of the Saviour's blood are preserved in Saint Andrew's Church, Mantua. Consult Laurence-Ascher, 'Orders of Chivalry' (London 1887), and Wahlen, 'Ordres de Chevalerie' (Brussels 1844).

BLOOD-STAINS, in medico-legal investigations, are subjects of some importance, particularly when murder is suspected and so-called blood-stains are to be investigated. The first question to be determined is whether the suspected stain is blood of any animal; secondly, is it human blood or that of a lower animal. To determine the first question certain tests have been devised. These are (1) the guaiac test, by which blood brought in contact with tincture of guaiac and hydrogen peroxide develops a blue color (not, however, conclusive); (2) the hæmin test, by which crystals are produced from the hæmoglobin and identified under the microscope; (3) the spectroscope test, which gives a spectrum of hæmoglobin; (4) the microscope test, by which the blood-corpuscles are identified. To answer the second question requires either (1) the microscopical examination that determines the size, shape and qualities of the blood-corpuscles; or (2) a much more reliable serum test, by which human serum, if brought in contact with the blood of an alien animal, causes dissolution of the blood-corpuscles of that animal's blood. By this serum test it is possible to detect any blood of any animal. The appearance of blood-stains varies, according to the character of the sub-are floating about. Plasma containes 90 per cent water, albumen, fat, mineral salts, also at times peptone or digested food and sometimes parasites and bacteria. Corpuscles or blood-cells are red and white, the latter to the former as 1 to 300. There are 5,000,000 or more per c.m. of the former, 10,000 to 20,000 of the latter. When the blood clots, the clot contains corpuscles and fibrin, the serum which is squeezed out contains the remainder.

Disease of the blood may exist from too much or too little of any of its elements, also from the presence of elements which are foreign to it. It is possible for the blood itself to be in such excess as to constitute the diseased condition called plethora. Full-blooded people have very red skin, are often stout, bleed easily and freely and are subject to apoplexy. They are often benefited by the loss of a few ounces of blood and the observation of that fact doubtless led to the custom of bleeding as a remedial measure. For a long time it was used so irrationally that its valuable features were obscured, and for years it was practically abandoned as a therapeutic measure.

The albumen is decidedly the most important constituent of the plasma for it furnishes food for the cells. This may be deficient or it may pass through the kidneys in large quantities as in Bright's disease. Sugar is one of the products of the chemistry of the body but it is alien to the blood and when it circulates with the blood the disease called diabetes is present. Fat may be in the blood in sufficient quantity to constitute the disease known as lipæmia. Fat is normally in the blood in two to four parts per thousand. During digestion and just afterward it is more abundant than at other times. In the condition of lipæmia it can be seen on the surface of blood which has been drawn. The mineral salts may be deficient or excessive, the former when one has been deprived for a long time of chloride of sodium or of food which contains it. It is possible for the watery elements of the blood to be excessive either actually or relatively. It is then commonly said that the blood is too thin, the condition being one of hydræmia and the indication is to increase the corpuscles or blood cells, particularly the red ones. This is a form of anæmia, and so is the condition called oligæmia when the actual volume of blood is too small, which is the situation after every severe hæmorrhage, or even after a profuse and persistent diarrhœa. It is the condition which always exists in the different forms of cholera.

The corpuscular elements of the blood are subject to many forms of disease which may be grouped in general under the term anæmia. When the red corpuscles are deficient after severe hæmorrhage or malarial poisoning or cancer or many forms of sickness there is great pallor of the skin and the condition is specifically oligocythæmia. Sometimes, especially in young girls, the skin has a greenish cast, this condition being known as chlorosis or the green sickness; it is not uncommon at the age of puberty. If the anæmia becomes very profound, going on usually to a fatal issue and the red corpuscles are reduced to perhaps a tenth of their usual number, it is called pernicious anæmia. Besides decrease in the number of corpuscles there may be diminution of the substance which is essential and vital to the red corpuscles because it carries the life-giving oxygen, and which is called hæmoglobin. The condition in this instance is known as oligochromæmia. Changes may also take place in the shape and size of the red corpuscles in various forms of disease, many of them may be very large or very small or crenated or dentated, or they may have nuclei which is extremely unusual for red corpuscles, or they may undergo destruction as in serious burns and in various kinds of poisoning. When this takes place and the liberated hæmoglobin circulates in the blood we have a condition known as hæmoglobinæmia. The white corpuscles are also very susceptible to change and to disease. In suppurative processes they are greatly increased in number, the condition being known as leucocytosis. In the very serious disease known as leucæmia or leucocythæmia their number is very greatly increased, so that their ratio to that of the red corpuscles instead of being 1 to 300 may be as high as 1 to 20. When the white blood cells are greatly diminished in number the condition is known as leucopenia.

The coagulating property of the blood may also be at fault and constitute disease. It has already been stated that the clot contains corpuscles and fibrin, the latter being the product of constituents within the blood which are not brought in contact so as to produce fibrin and a clot until there is some injury to the inner wall of a blood vessel or the blood is arrested in its course or until it is discharged from a vessel or vessels into the tissues or cavities of the body or outside the body. There are persons called bleeders in whom the constituents of fibrin do not exist in proper proportion or proper quantity and when bleeding takes place it is almost impossible to stop it because a clot does not form. Such persons may lose their lives from the smallest injury like the pulling of a tooth or a scratch of the finger.

Disease may be present from extraneous or abnormal elements in the blood like metallic poisons of various kinds, waste matters, foreign bodies consisting of particles of various substances. If there is black coloring matter the condition is melanæmia, acetone in connection with diabetes produces acetonæmia, bile circulating in the blood causes cholæmia.

A very important and serious condition is known as uræmia when waste material which should be excreted through the kidneys, as urea, is retained in the blood. Uræmic convulsions result fatally in the majority of cases. In ammonæmia ammonia is absorbed into the blood from the decomposed urine in the bladder.

Lithæmia indicates the presence of lithates in the blood in diseases like rheumatism. A disease of the blood once very common, but now less common because of the practice of antisepsis, is pyæmia when pus circulates freely in the blood current.

In septicæmia we have a general term for blood poisoning from almost any source but particularly from infectious material. We may have infectious germs of various kinds in the blood. One of the most important tests of the blood, the Wassermann test, is for determining the presence or absence of the germ of syphilis. Many other tests of the blood is plugged after an injury or after it has been tied by the surgeon with a ligature. The cutting off the circulation in the area supplied by the vessel is like depriving the soil of moisture, and unless the tissue in question is supplied by neighboring vessels which make new channels to take the place of those which have been obliterated, its nutrition suffers greatly. If the vessel is one of considerable size or if it is a terminal vessel, the tissue dies and experiences gangrene or decomposition.

This is what happens not infrequently in the lower extremities, especially in the aged, and in the disease known as diabetes, one or more of the toes or even the entire foot becomes gangrenous and requires amputation. A plug of this kind is called a thrombus, and the disease thrombosis and may occur either in arteries or veins. Besides the terminal arteries of the lower extremities which are thus diseased this condition occurs in the terminal arteries of the kidneys, lungs, spleen and brain, with more or fewer ruptures, hæmorrhages and destruction of tissue.

Friability or brittleness of the arteries is also a frequent form of disease, and particularly also in the aged. This is the condition known as arterio-sclerosis, when there may be a formation of new connective tissue in the arteries increasing their density, or a deposit of mineral salts, especially of lime, causing them to break easily. Both of these conditions often terminate in cerebral hæmorrhage or apoplexy.

A very common form of disease affecting arteries in particular, but sometimes veins, and sometimes resulting in communication between an artery and a vein and the commingling of blood currents, is aneurism, in which one or more of the inner coats gives way, forming a larger or smaller tumor or bulge of the vessel. If this tumor ruptures, hæmorrhage takes place into the surrounding tissue until there is sufficient pressure or a sufficiently dense clot to arrest it. In the case of large arteries or arteries in vital structures like the brain the hæmorrhage is not infrequently fatal. Arteries that are diseased from syphilis or that are deficient in elastic or muscular tissue, or those that are subject to frequent and powerful strain, are often the seat of aneurism, and athletes, porters, truckmen and others who bear heavy weights are frequently victims.

Blood vessels like other tissues are supplied with vessels, nerves and lymphatics for their nourishment and their functional activity. The nerve supply, especially that of the small arteries, is of very great importance, consisting of vaso-dilator fibres from the cerebro-spinal and vaso-inhibitory fibres from the sympathetic system. When one or the other apparatus of this kind is diseased or out of order there is disturbance in the circulation of the vessels involved and in the tissues they supply, paralysis of the inhibitory nerves, meaning dilatation of the blood vessels and congestion of the tissues, and paralysis of the dilator nerves, meaning constriction of blood vessels and anæmia and pallor of the tissues.

The obscurity of most of the diseases of the blood vessels makes their determination very difficult until an accident, perhaps of serious character, has occurred. We are able to detect hardening of the arteries by the physical characteristics and the recent studies in blood pressure are clearing up important questions in other particulars, but there remains much to be found out before the pathology of the blood vessels will be entirely elucidated.

Arteries may have acute or chronic disease, with or without inflammation. When an artery is inflamed its calibre may be diminished, or even obliterated (endarteritis obliterans) or it may be increased (endarteritis deformans). Arterial diseases which are not inflammatory may be degenerative, fatty, amyloid or calcareous. Tuberculosis rarely attacks the structure of the arteries, and the very common condition known as atheroma, very often associated with syphilis, is a chronic inflammation with degeneration. Atheroma often terminates in ulcer with deposits of salts of lime in its vicinity.

Acute inflammation of an artery may be caused by the irritation, and possibly the infection, of an embolus or plug, from the consequences of ligation, or by the extension of a neighboring suppurating wound or ulcer. Inflammation of the arteries with enlargement of calibre is most often seen in the aged, the aorta being frequently attacked. With it may be associated atheroma, fatty degeneration or calcification. Fatty degeneration also usually accompanies atheroma and calcification. It is probable that the veins are less susceptible to disease than the arteries, though there are acute and chronic forms of phlebitis. Injuries to veins are rather more frequent than to arteries on account of the exposed position near the surface of those which constitute the superficial system of veins. They are also very subject to the formation of thrombi because of the fibrin in their walls. Acute phlebitis may be adhesive or suppurative and is one of the accompaniments of an infectious process in pregnancy and child-bed. A suppurative phlebitis may be an extension of a suppurating process in tissues adjacent to a vein which is attacked, and in pyæmia the veins are filled with pus. An adhesive inflammation in veins may result from traumatism or from some form of poison in the blood. The veins may be the seat of calcification and of ulcers as well as the arteries.

Tuberculosis is probably more frequent in veins than in arteries, especially when it results from an extension of the disease in the neighboring lymphatics. See ARTERIES; ATHEROMA; CAPILLARIES; GOUT; PYÆMIA; RHEUMATISM; SYPHILIS. ANDREW F. CURRIER, M.D.

BLOODBIRD, a black honey-eater of southern Australia, whose head, neck, breast and back (of the male) are scarlet red.

BLOODHOUND, a dog of the «hound» build, commonly used for tracking fugitives. It usually stands from 25 to 27 inches high at the shoulders and weighs about 90 pounds. In appearance it is of a sedately noble expression, with a wise-looking, wrinkled face. Its color is black, mingled with a rich tan on the legs; a few are all tan. Its coat is short and glossy, the ears large and pendant, and the eyes deeply sunken and showing a third lid or «haw.» It has a somewhat loose skin for so muscular a dog and quite a dewlap in front of the throat. It has a wonderful power of scent, by means of which, aided by judicious training, it is enabled to follow the footsteps of a particular man, though they may be crossed and recrossed a thousand times by other footsteps and though they lead over bare pavements. The true bloodhound suffers from an unfortunate name, which seems to suggest bloodthirstiness, a quality very far removed from his real disposition. The term «bloodhound» originally meant simply that the dog was thoroughbred in the same sense that a horse or other animal is of «blood» or «blooded» stock. In the early days the Spaniards introduced into Cuba and South America dogs which had some of the characteristics of the bloodhound but were really a cross between the ferocious war-dog of the ancients and the big Spanish pointer. These dogs had evil dispositions and were capable of great ferocity, and their sins have been visited on the real but innocent bloodhound. The true bloodhound will trail a man to the last of its strength but will not voluntarily attack him. When it has located him, it will keep guard and prevent his escape, and may, if attacked, use its great powers in self-defense, but not in the savage manner generally attributed to it; it is not in its nature to be cruel.

BLOODROOT. See SANGUINARIA.

BLOODSTONE. See HELIOTROPE; HEMATITE.

BLOODWORM, the larvæ of species of *Chironomus,* gnats allied to the mosquito. The worms live in fresh-water pools and sluggish streams. They are long, slender and wormlike, and certain species are blood-red in color. The flies have very feathery antennæ and do not bite. The larvæ usually have no tracheæ. The red color of these larvæ is due to hæmoglobin, a substance that has the power of attracting and storing oxygen and giving it off to the tissues as they require it. Such larvæ are able to live in burrows which they construct in the mud. Some of them, provided plentifully with hæmoglobin, are in consequence able to live at great depths (it is said even at 1,000 feet in Lake Superior) and come to the surface only occasionally. A few are even able to tolerate salt water and have been fished up from considerable depths in the sea. It is a remarkable fact that these physiological capacities differ greatly within the limits of the one genus, *Chironomus,* for some of these species are destitute of hæmoglobin and have to live near the surface of the water; in these there is a well-developed tracheal system.

BLOODWORT. See SANGUINARIA.

BLOODY ASSIZES, the name given by the people to a series of trials held in England by Judge Jeffreys, in 1685, after the suppression of the Duke of Monmouth's rebellion. Upward of 300 persons were executed after short trials; very many were whipped, imprisoned and fined, and nearly 1,000 were sent as slaves to the American plantations. See JEFFREYS, GEORGE.

BLOODY BILL, in American politics, an act sometimes called the FORCE BILL, passed by Congress 2 March 1833. Its aim was to enforce the Tariff Law of 1832, which the legislature of South Carolina had declared null and void. See UNITED STATES, TARIFF IN THE.

BLOODY FALLS, the lowest cataract of the Coppermine River in the Northwest Territories of Canada, so named because of a massacre here of Eskimos by Chippewa Indians in 1770.

BLOODY MARY, a popular designation of Mary, Queen of England, on account of the persecutions of the Protestants during her reign (1553–58).

BLOODY SHIRT, a term used about 1880 in Congress to revive the memories of the Civil War by impassioned allusions as «to wave the bloody shirt.»

BLOODY TOWER, a term popularly applied to that portion of the Tower of London in which Richard III is alleged to have caused the murder of his nephews, Edward V and the Duke of York.

BLOOM, the powdery or waxy protective film upon fruits, as grape and plum, and upon leaves and stems, as cabbage. It is especially noticeable upon desert plants. See also XEROPHYTES.

BLOOM, a lump of puddled iron, which leaves the furnace in a rough state, to be subsequently rolled into bars or other form into which it may be desired to convert the metal. Also a lump of iron made directly from the ore by a furnace called a bloomery. See IRON.

BLOOMER, Amelia Jenks, American reformer: b. Homer, N. Y., 27 May 1818; d. Council Bluffs, Ia., 30 Dec. 1894. She was married in 1840 to Dexter C. Bloomer of Seneca Falls, N. Y., where for several years she and her husband were engaged in publishing a semi-monthly periodical. In 1849 she began publishing *The Lily* in the interests of temperance reform and women's rights; in 1853, on removing to Mount Vernon, Ohio, she resumed its publication there, and also became associate editor of *The Western Home Journal.* In 1855 the couple removed to Council Bluffs, Iowa, where Mr. Bloomer became an organizer of the Republican party in that State and a Federal official and a judge. She carried on her reformatory work for many years. Mrs. Bloomer is remembered chiefly because of her personal adoption and her active advocacy of a costume which had been devised by Mrs. Elizabeth Smith Miller and which became more popularly known as the Bloomer costume (q.v.).

BLOOMER COSTUME, a style of dress introduced about the year 1849 by Mrs. Amelia Jenks Bloomer (q.v.), who proposed thereby to effect a complete revolution in female dress and add materially to the health and comfort of her sex. It consisted of a jacket with close sleeves, a skirt reaching a little below the knee and a pair of Turkish pantaloons secured by bands around the ankles. Though adopted rather extensively in America, it was unable to hold its ground against the united strength of prejudice and ridicule, and abroad it scarcely made further way than furnishing a favorite subject of burlesque on the stage and of ridicule in the pages of the comic papers. One or two «strong-minded» women who ventured to brave public opinion in London by donning the new costume were persecuted by the mob. This movement, however, led the way to more rational dress and to the divided skirt. The bloomer is now used for athletic and gymnastic exercises only.

BLOOMFIELD, Joseph, American soldier: b. Woodbridge, N. J., about 1755; d. Burlington, N. Y., 3 Oct. 1823. When the Revolutionary War broke out he was studying law but joined the cause of the colonists with enthusiasm. In 1776 he received a captain's commission in the 3d New Jersey regiment, served with distinction throughout the war and was mustered out a major. Resuming his legal studies, he acquired a successful practice in Burlington, was elected attorney-general and twice (1801, 1812) governor of the State. During the War of 1812 he commanded a brigade. From 1817 to 1821 he was a representative in Congress, and as chairman of the committee on Revolutionary pensions he reported the bill granting pensions to soldiers of the Revolutionary army. In 1793 he was appointed a trustee of Princeton and during his eight years' membership of the board did much to promote the interests of that college.

BLOOMFIELD, Maurice, American educator: b. Bielitz, Austria, 23 Feb. 1855. He studied at the University of Chicago, 1871–74; Furman University, 1876–77; fellow of Johns Hopkins, 1878–79; received degree of Ph.D. from the latter in 1879 and from Berlin and Leipzig in 1879 and 1881, respectively; LL.D., Princeton University, 1896; has been professor of Sanskrit and comparative philology at Johns Hopkins since 1881; is member of the Royal Bohemian Society, honorary member Finno-Ugrian Society (Helsingfors); member of the American Oriental Society, the American Philological Association, the National Institute of the Social Sciences; fellow of the American Academy of Arts and Sciences and member of the advisory council of the Simplified Spelling Board. He edited for the first time from the original Sanskrit manuscript the ‹Grihyasamgraha› of Gobhilaputra, and the ‹Sutra of Kauçika›; translated the ‹Atharva-Veda› (1899) in the ‹Sacred Books of the East.› He published ‹Cerberus, the Dog of Hades› (1905); ‹A Concordance of the Vedas› (1907) and ‹The Religion of the Veda› (1908); and has also contributed to numerous learned journals and reviews on subjects connected with the history, religion, language and literature of ancient India; on Sanskrit, Greek, Latin and comparative grammar; on ethnology and the science of religions.

BLOOMFIELD, Robert, English poet: b. Honington, Suffolk, 3 Dec. 1766; d. Shefford, 19 Aug. 1823. He learned to read at the village school, and in 1781 was sent to learn the trade of a shoemaker with his brother in London. The visiting of several places of worship, a debating society, Covent Garden Theatre, and the reading of sundry books, called forth his faculties, and he became almost unconsciously a poet. Hearing him one day repeat a song which he had composed, his astonished brother prevailed on him to offer it to the *London Magazine,* and it was accepted. The piece was called ‹The Milkmaid.› A second, ‹The Sailor's Return,› likewise found a place in that journal. Thomson's ‹Seasons,› ‹Paradise Lost,› and other works of this kind, now became the subjects of his constant study. In the country, where he resided for a short time in 1786, he first conceived the idea of his poem, ‹The Farmer's Boy,› which is characterized by a spirit of rural simplicity and innocence. It was written under the most unfavorable circumstances, in a garret. It was first shown to Capel Lofft in 1798, who was so much pleased with it that, in conjunction with his friend Hill, he had it printed in 1800. Bloomfield was patronized by the Duke of Grafton, who bestowed on him a small annuity and made him an under-sealer in the seal-office. This situation he was forced to resign on account of ill health. He then worked again at his trade as a shoemaker, and employed himself in constructing Æolian harps. Engaging in the book trade he became a bankrupt, and in the latter part of his life was afflicted with violent headaches and became nearly blind. He was gradually reduced to such a state of nervous irritability that apprehensions were entertained of his becoming insane. These fears were terminated by his death. Consult Hart, ‹Selections from Correspondence› (London 1870) and Weston, ‹Works of Robert Bloomfield› (London 1824).

BLOOMFIELD, William Ernest, English Baptist clergyman: b. Rayleigh, Essex, 23 Oct. 1862. He was minister of Elm Road Baptist Church, Breckenham, from 1884 to 1886, and minister of Turret Green Church, Ipswich, the following 10 years, and the Red Church, Coventry, for the next 10 years. He is noted as a Hebrew and Greek scholar. He was fellow Senatus Academicus (1897) for proficiency in those languages, especially with their relationship to the literature of the New Testament. He was also first prizeman in the University of London (1900) at the Further Scriptural Examination. Since then he has contributed notable studies along the same lines.

BLOOMFIELD, Ind., town and county-seat of Greene County, 75 miles southwest of Indianapolis, on the Illinois Central, the Chicago, Indianapolis and Louisville and the Evansville and Indianapolis railroads, and on the White River. It has an extensive trade in agricultural products, coal, lumber and live stock; contains a Carnegie library, flouring mills, lumber factories and manufactories of chairs, tools and novelties, of steel, iron, wood and clay. Pop. 2,069.

BLOOMFIELD, Iowa, city, county-seat of Davis County, on the Burlington and the Wabash railroads, seven miles northwest of Keokuk. It is the trading centre of a busy agricultural region and maintains municipal water works and electric-lighting plant. It is the seat of the Southern Iowa Normal School, and has a Carnegie library and a fine high school building. Pop. 2,028.

BLOOMFIELD, N. J., a township in Essex County, on the Delaware, L. & W., and the Erie railroads, the Morris Canal, and trolley lines connecting with Newark, which it directly adjoins, the Oranges, Jersey City and other cities, 10 miles northwest of New York. It was founded in 1675, under the name of Watsessing, and received its present name from Gen. Joseph Bloomfield in 1796. The First Presbyterian Church, the oldest in the town, dates from this year. Bloomfield was a part of

Newark until 1912, when it was incorporated as a separate township. It once ranked as an educational centre and is now the site of a German theological seminary (Presbyterian, opened 1869). It has a fine Mountainside Hospital, the Jarvis Memorial Library, the Job Haines House for Aged Men and Knox Hall. The "commons," dating from Revolutionary days, has been enlarged into a fine public park. The town contains the residences of many New York business men; and is engaged in the manufacture of church and cabinet organs, woolen goods, hats, shoes, rubber goods, tissue and photographic paper, saddlery, hardware, lamps, pins, brushes, cod-liver oil, electric elevators and a variety of brass goods. The United States census of manufactures for 1914 recorded 57 industrial establishments, employing 4,100 persons, of whom 3,177 were wage earners, receiving annually $1,644,000 in wages. The capital invested aggregated $8,793,000, and the year's output was valued at $8,358,000: of this $4,998,000 was added by manufacture. It has a national bank, daily and weekly newspapers, and an assessed property valuation of nearly $4,000,000. The government, under a charter of 1900, is vested in a mayor and town council. Pop. (1920) 22,019. Consult 'Bloomfield Old and New,' edited by J. F. Folsom (Bloomfield 1912).

BLOOMINGTON, Ill., city and county-seat of McLean County, situated near the geographical centre of the State, 126 miles south of Chicago and on the Illinois Central, Chicago & Alton, Big Four and Lake Erie & Western railroads. Bloomington is in the heart of the famous Illinois corn belt, surrounded by one of the richest and most productive agricultural sections in the world, where the largest nurseries in the State, comprising over 1,000 acres, are located. It is engaged in the manufacture of farm implements, flour and feed, stoves and furnaces, brick and tile, canned goods, harness, store fixtures and portable elevators; has a coal shaft lifting 700 tons of coal per day, ornamental iron works and cigar factories, a brewery and a pork-packing establishment. There are seven banks — three national and four State — with a combined capital and surplus of $1,815,000, and deposits of $8,000,000. The city has three beautiful parks and is noted for its fine brick pavements and beautiful drives, having more than any other city of its size. There are 32 churches of all denominations, a fine public school system, with a high school, 12 grammar schools, three parochial schools and several excellent private schools; a commercial college, a college of oratory and three of music. Bloomington has one of the largest and best selected public libraries in the State and several law libraries. The Illinois Wesleyan University (q.v.) and the Soldier's Orphan Home are located here, and the Illinois State Normal University (q.v.), which has long been known as one of the best institutions in the Union for the education of teachers, is situated at Normal, a suburb about two miles distant from the court-house, and connected by electric railway. Among the public buildings are a large court-house, four opera houses, and several commodious public halls. The city was first settled by pioneers from New England and Kentucky and became a borough in 1831 and was incorporated in 1851. The government is vested in a mayor and a board of four commissioners elected biennially. The city has an electric railway system, operating over 20 miles of track, and a well-trained fire department; is lighted by gas and electricity and controls its water works. Pop. (1920) 28,725.

BLOOMINGTON, Ind., city and county-seat of Monroe County, on the Chicago, Ind. & L. and the Indianapolis Southern railroads, 50 miles south of Indianapolis. It is in a limestone and quarry region; is the seat of the Indiana State University (q.v.); and besides its farming and quarrying interests has flour, saw and planing mills, and important manufacturing concerns, especially in the lines of leather, hardware, furniture, baskets, glass novelties, creosoted paving blocks, storage batteries and brooms. The United States census of manufactures for 1914 recorded 40 industrial establishments of factory grade, employing 1,180 persons, of whom 1,059 were wage earners, receiving annually $581,000 in wages. The capital invested aggregated $2,407,000, and the value of the year's output was $2,329,000: of this, $959,000 was the value added by manufacture. The city has the Monroe County Library, a court-house, theatre, hospital, a national bank, several daily and weekly periodicals, and a property valuation of over $1,500,000. It was settled in 1818 and was incorporated as a city in 1876. The government, under a general State law, is vested in a mayor, elected every four years, and a council. Pop. (1920) 11,595.

BLOOMSBURG, Pa., town and county-seat of Columbia County, on the Susquehanna River, the Pennsylvania Canal, and on the Pennsylvania, the D., L. & W., the Philadelphia & R., the Bloomsburg & S., and the Susquehanna, B. & B. railroads, 40 miles west of Wilkesbarre. It is in an iron and limestone region, and contains a number of iron furnaces and foundries, silk, carpet, hosiery and woolen mills, brick plants, machine and wood-working shops, match, broom and furniture factories. There are three national banks with a combined capital of $3,500,000. Bloomsburg is the seat of the State Normal School and has an excellent public school system, including a high school and two grammar schools. There are eight churches. Of interest are the town-hall, the public library, the court-house and the athletic park and playground. Ten squares of the city's streets are paved, the others being of macadam. The water supply is from a mountain stream. The assessed property valuation is about $3,000,000. The government is by mayor and council, under a special act of the legislature of 1870. Receipts in 1915 approximated $32,000, expenses $41,100. Pop. 7,413.

BLOOR, Alfred Janson, American architect: b. 1828; d. Stonington, Conn., 19 Nov. 1917. He was one of the founders and a life member of the Metropolitan Museum of Art, New York city, and designed many of the largest buildings in that city half a century ago. He became a fellow of the American Institute of Architects in 1861, and for over 50 years was actively engaged in its official capacities. He was a member of the Willard Architectural Commission in 1886; a life member of the American Numismatic Society; an honorary and corresponding member of the Royal Society of Portuguese Architects and Archæologists; and of the English Royal Society of Arts. During the Civil War he acted as assistant secretary to the United States Sanitary Commission. He wrote ‘Architectural and other Art Societies of Europe, with Suggestions for an Architectural Art Society and Branches in America’ (1868); ‘Woman’s Work in the Civil War’ (1866); a large number of monographs on various topics and translations of poetry in several languages.

BLOUET, bloo-ā, **Léon Paul** (Max O’Rell), French lecturer and author: b. Brittany, France, 2 March 1848; d. Paris, 25 May 1903. In early life he was an officer in the French army, fought in the Franco-Prussian War of 1870–71, but in 1873 went to England as newspaper correspondent. Later (1876–84) he taught at Saint Paul’s School and in the University of London. After the publication of his first book, ‘John Bull and His Island’ (1883), he abandoned teaching and devoted himself to literature. His works include ‘John Bull and His Daughters’ (1884); ‘Friend MacDonald’ (1887); ‘Jonathan and His Continent’ (1888, with Jack Allyn); ‘A Frenchman in America’ (1891); ‘John Bull & Co.’ (1894); English Pharisees and French Crocodiles’ (1892) and similar works which had a wide circulation throughout the English-speaking world. His works, written in French, were translated by his wife. His works are humorous and truthful but are not careful studies. In 1900, appeared his ‘Femme et artiste,’ followed by ‘Sa Majesté l’Amour’ (1901), and, after his death, by ‘Confidentiel’ (1904). In 1887 and 1890 he lectured in America; in 1893 with his wife and daughter he made a round of the English colonies, his readiness as a speaker and lecturer ensuring him a welcome everywhere. In 1902 he settled in Paris as correspondent of the New York *Journal* and wrote in the *Figaro* in support of the *entente cordiale* between England and France. Tolerant, shrewd and impartial Blouet could mix much flattery with his witty banter. Consult ‘Men and Women of the Time.’

BLOUNT, James H., American legislator: b. Macon, Ga., 12 Sept. 1837; d. Macon, Ga., 9 March 1903. He was graduated from the University of Georgia in 1857; studied law and was admitted to the bar in 1858. He first came into public notice in 1865, when, after having served in the Confederate army, he was a delegate to the Georgia Constitutional Convention. Thereafter he devoted himself to the practice of law until 1872, when he was elected to Congress from the 6th District of Georgia. He held his seat by successive re-elections till 1893, when he declined a further term. As he finished his last term the House paid him the unusual honor of suspending its proceedings to give the members an opportunity to testify to their appreciation of his worth. In his last term he was chairman of the committee on foreign affairs, and his familiarity with American relations with other countries led President Cleveland to appoint him commissioner paramount to Hawaii in March 1893, for the purpose of investigating the deposition of the royal government and the establishment of the American protectorate over the kingdom. On his arrival in Honolulu he at once caused the American flag to be hauled down from the Provisional Government House, and the United States marines to be withdrawn from the locality. This proceeding led to considerable excitement in the United States; the withdrawal of United States Minister Stevens from Honolulu; the appointment of Commissioner Blount as his successor; and a renewal both in Washington and Honolulu of the agitation for the annexation of Hawaii to the United States. On the completion of his mission Minister Blount retired to his large Georgia estates. See Hawaii.

BLOUNT, William, American statesman: b. Bertie County, N. C., 26 March 1749; d. Knoxville, Tenn., 27 March 1800. He took part in the battle of Almanace in 1771, became an officer in the Continental army and was a member of the State assembly at intervals from 1780 to 1790. He was a delegate to the Continental Congress in 1782, 1783, 1786 and 1787; a framer and signer of the Federal Constitution of 1787; a member of the State Ratification Convention in 1789, and negotiated treaties with the Cherokee, Choctaw and Chickasaw Indians in 1786. He served as governor of the territory south of the Ohio River and as superintendent of Indian affairs under Washington 1790–96. In the latter year he was president of the Tennessee State Constitutional Convention and on the admission of Tennessee took his seat in the United States Senate, 5 Dec. 1796. In the Senate he was accused of criminal designs in projecting a conspiracy with Great Britain, seeking to prevent Spain from ceding the territories of West Florida and Louisiana to France. He was expélled from the Senate, 8 July 1797, pending the trial of his case, which was finally dismissed in 1799. The scheme is known in United States history as «Blount’s Conspiracy.» Blount afterward served as State senator. Consult Wright, Marcus J., ‘Life and Services of William Blount’ (1884) and article by Mrs. M. J. Lamb in *Magazine of American History* (Vol. XIII, New York 1884).

BLOW, John, English composer and musician: b. North Collingham, Nottinghamshire, 1648; d. 1708. He was trained at the Chapel Royal under Capt. Henry Cooke; became organist of Westminster Abbey at the age of 21, and in 1676 also organist of the Chapel Royal, and obtained the degree of doctor of music. In 1680 he resigned his post in Westminster Abbey to his pupil Purcell. He was master of the choristers at Saint Paul’s Cathedral from 1687 to 1693. In 1699 he was appointed composer to the Chapel Royal. He was a voluminous composer, but many of his works have never been printed. Among his sacred pieces are upward of 100 anthems, 14 church services and various other compositions. He published ‘Lessons for the Harpsichord’ (1698). A number of his secular compositions for one, two or three voices, with accompaniment, were published under the name of ‘Amphion Anglicus’ (1700).

BLOW, Susan Elizabeth, American educator: b. Saint Louis, Mo., 1843; d. New York, 26 March 1916. She was educated in her native city and in Germany, where she studied the kindergarten system. She returned to the United States in 1873, a staunch disciple of

Frœbel and his method. She was imbued with a feeling that public school kindergartens in this country were a necessity, and she established one in Saint Louis, which was soon adjudged successful, and «play, art, work» became an actuality for small children. The idea spread rapidly and Miss Blow opened in Saint Louis a school in which to train kindergarten teachers, with post-graduate courses for those interested in the deeper theories of child education. She kept at her work in Saint Louis until 1886 when she withdrew because of ill-health. During her enforced rest she wrote 'Symbolic Education.' When her health improved she began a course of lectures describing her theories of child education. She considered her work of true interest only to teachers and other educators. She is considered to have been the «mother of the kindergarten» in the public schools of the United States, and, after Frœbel, one of the greatest of child educators.

BLOW-FLY, a common fly belonging to the family *Muscidæ*. It is the large, noisy fly which enters houses, and was named *Calliphora vomitoria* by Linnæus. It is black on the head and thorax, while the abdomen is steel-blue. It is similar to the flesh-fly in habits, but instead of living larvæ it deposits its eggs, which are long and cylindrical, in stacks («fly-blows») on meat, cheese, etc. The larvæ hatch in 24 hours; they become fully grown in probably five or six days, and transform into pupæ enclosed by a brown shell (puparium), formed by the drying and contraction of the larval skin. Oily or greasy substances are avoided by them, and by all other flies, and a cloth dipped in kerosene oil and suspended in a room will keep them from entering it. Another blow-fly is *Calliphora erythrocephala*, common to Europe and North America. See FLESH FLY.

BLOWGUN, a weapon formerly used by the Indians inhabiting the shores of the Gulf of Mexico, by the Iroquois of New York, and still employed by some of the Indian tribes of South America, and by the Malays of the East Indies, both in war and for killing game. It consists of a long, straight tube in which a small poisoned arrow is placed, and forcibly expelled by the breath. The tube or blowgun, called *gravatána, puncuna*, etc., is 8 to 12 feet long; the bore not generally large enough to admit the little finger. It is made of reed or of the stem of a small palm. A sight is affixed to it near the end. The arrows used are 15 to 18 inches long, made of the spines of another palm, sharply pointed, notched so as to break off in the wound, and their points covered with curari poison. A little soft down of the silk-cotton tree is twisted round each arrow, so as exactly to fit the tube.

BLOWHOLE. See SPOUTING HORN.

BLOWING MACHINES. The term blowing machine or blower is applied to various forms of mechanical arrangements employed for the production of artificial currents of air for ventilating purposes, for forced draught for furnaces, etc. They are also employed as exhausters for the removal of smoke and fumes from smelting works, foundries, etc., for the removal of sawdust and wood planings from saw mills and planing mills, and for handling such material as emery, coffee, metal filings, etc. The various forms of blowers may be conveniently divided into the following general classes:

Bellows.— These comprise the earliest forms of blowing machines and are also the most familiar at the present time. In their earlier forms, still used in some Oriental countries, they consisted of simple bags of skin each equipped with a valve and nozzle. A more elaborate application of the same principle is found in the ordinary domestic bellows and those used in the blacksmiths' shops.

Piston Blowers.— The simplest form of a piston blower consists of a square wooden chamber with a close fitting piston working within it. When the piston is drawn backward, air is sucked into the chamber through a flap valve, and when the piston is pushed forward this air is compressed and forced out through the nozzle.

Blowing-Engines.— The air pump or air compressor used for producing low pressure represents the modern form of piston blowers. Various types of these machines are extensively used for supplying the air blast to the cupolas of blast furnaces, Bessemer converters, etc. They are driven by either steam, gas or water power, and are then commonly known as blowing-engines. A machine of this type usually consists of a power cylinder operating a piston either by steam or gas, and an air compressor cylinder which delivers the compressed air into the blast pipes. In the horizontal engines, the two cylinders are placed tandem to each other with the compressor cylinder in front. In the vertical engines, the compressor cylinder is usually placed on top of the power cylinder. The pistons of both cylinders are carried on a common piston rod, and the engines are usually provided with heavy flywheels to insure steady operation.

In many forms of steam blowing-engines, the power cylinders are compounded, while those of gas engine installations are often made double-acting, and sometimes two power cylinders placed tandem to each other and to the compressor cylinder are successfully employed.

The recent discovery of the suitability of blast furnace gas, i.e., the gas which passes out of the top of blast furnaces employed for the smelting of iron ores, has greatly tended toward the development of large gas engines specially adapted for blowing purposes. Up to the year 1900, the largest engine of this type was a Cockerill engine of about 600 horse power, but since then, the capacities of these machines have been greatly increased, and engine units developing many thousand horse power are being built in the United States and in Europe for this purpose. See INTERNAL COMBUSTION ENGINES.

Rotary Blowers.— This type of machines includes various forms of disc blowers and fans which are generally used for ventilating purposes. See COAL MINING MACHINERY.

The disc blowers are built in sizes ranging from one to ten feet in diameter, and are capable of delivering from 1,000 to 250,000 cubic feet of air per minute, according to their size and the number of revolutions per minute at which they are operated.

Disc blowers are often called fans, but it is well to understand that in the former the blades are set at an angle to the axle, while in a fan blower proper the blades are set parallel to the axle on radial spokes in a manner similar to the setting of the paddles on a paddle wheel. These blades may be either flat or curved in both cases, and are arranged to revolve in a steel or cast iron casing or shell so designed that the air is sucked in through a larger or smaller orifice at the side and forced out through an outlet leading from the periphery.

The ordinary pressure blowers are merely another form of fan blowers. They were originally designed for use with cupola furnaces, and forges, but are also extensively used for producing mechanical draught for the furnaces of boilers, for use with mechanical stokers, sand blast machines, pneumatic tube delivery systems, etc., or for any work requiring pressures as high as 16 ounces per square inch.

The fan wheels are usually made of thin galvanized steel, and are enclosed in a shell of cast iron. The larger sizes are usually provided with two driving pulleys, and are usually made to discharge horizontally at the bottom, but they can be built in any other of the four right angles. See Fig. 1.

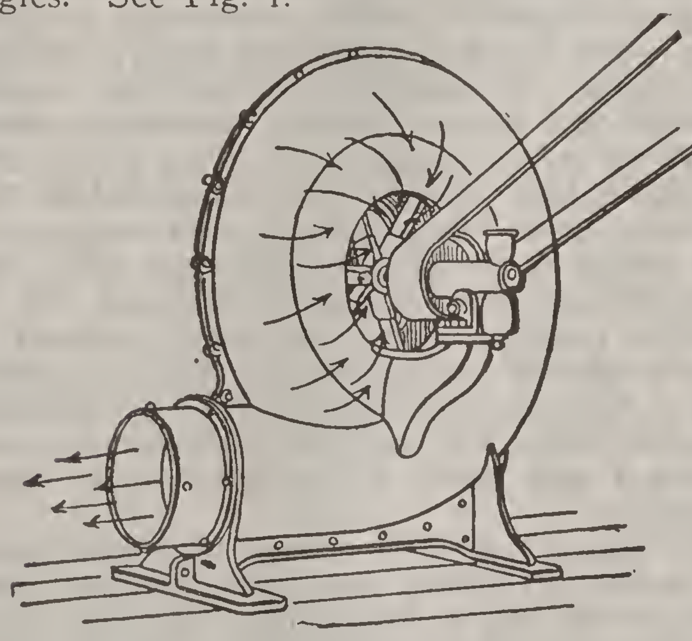


Fig. 1.— Pressure Blower.

Positive Blowers.— These machines are a more recent form of the rotary blowers, and are very extensively used for operating high pressure forges, blow-torches, gas furnaces, low pressure sand blasts, small pneumatic tube systems, and similar purposes requiring a capacity ranging from 25 to 150 cubic feet of air per minute at a pressure ranging from four to eight ounces. They can be driven by direct connection engines and electric motors, or by power driven belting, and the principle of rotary motion applied to air under high pressure appears to eliminate a great deal of the incidental friction, so that when high efficiencies can be obtained they are preferable to fans and blowing engines.

These machines consist of an outside casing or cylinder of cast iron provided with massive head plates which carry the journal boxes as shown by Fig. 2, which illustrates a horizontal blower geared to an electric motor on the same bed plate. Within this casing, two impellers revolve on horizontal shafts which are connected by gear wheels outside the casing, thus giving them an invariable relative motion. The contact surfaces of the impellers are formed on mathematically correct lines, and they revolve together with uniform clearance and without metallic contact either with each other or with the enclosing casing, thus preventing internal friction. There are no waste spaces between the impellers to cause the formation of air pockets, and no sharp corners or edges to produce sound vibrations, and as the impellers are symmetrical relatively to their shaft centres, they remain perfectly balanced at all speeds.

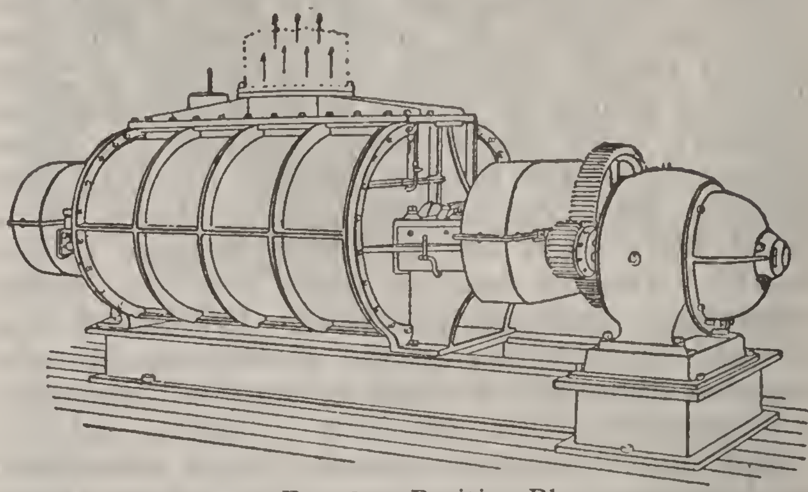


Fig. 2.— Positive Blower.

High Pressure Positive Blowers.— In this type, where the heat of compression constitutes an element of danger, the entire casing and journal boxes are water jacketed, and complete water circulation is maintained through the impellers and the casing during operation in order to prevent expansion under the temperatures due to the high pressures of compression. The water is forced into the impellers at one end through a hole drilled into the centre of the shaft, and out at the other through a similar passage.

These machines will maintain a pressure ranging from seven to ten pounds per square inch. In some designs a spray of water is used to pack the machines so as to prevent the air from escaping backward, and also for the purpose of absorbing the heat due to compression. This water is carried over into a separating tank and drained off automatically. This method enables the attainment of an efficiency under high pressures fully as high as that attained under pressures ranging from three to four pounds. See Heating and Ventilating; Air Compressor.

BLOWITZ, blō-vĭtz, **Henri Georges Stéphane Adolphe Opper de**, French journalist: b. Pilsen, Austria, 28 Dec. 1825; d. Paris, 18 Jan. 1903. He settled in France; was successively appointed professor of German in the Lycée of Tours and at Limoges, Poitiers and Marseilles; was naturalized a French citizen in 1870; and became the Paris correspondent of the London *Times* in 1871. Laurence Oliphant was then the correspondent at Paris, and de Blowitz became his assistant. During the war of 1870–71 Oliphant was excluded from Paris during the siege by the Germans, but de Blowitz, by means of carrier pigeons, balloons and numerous ingenious devices, kept his chief outside the city walls informed as to what was going on within the beleagured city. For information sent to the French government which aided in suppressing a Communistic rising in Marseilles, he was decorated with the Cross of the Legion of Honor. He was noted for his success in obtaining secret and important information long before it was ready for official promulgation. He was one of the first to see the value of the «interview»; and his reputation was enhanced by interviews with exalted and eminent personages. Many of his disclosures in his letters to the *Times,* such as the text of the Treaty of Berlin, which he forwarded before it had been signed, created much excitement throughout Europe. He contributed more than 4,000 columns to the *Times.* He published 'Feuilles volantes' (1858); 'l'Allemagne et la Provence' (1869); 'Le mariage royal d'Espagne' (1878); 'Une course à Constantinople' (1884). An English translation of his memoirs appeared in 1904.

BLOWPIPE, a tube or pipe arranged to blow air or a gas against a flame, as of a gas-jet, so that it may be concentrated upon a small surface. Its most usual form is described in the article on blowpipe analysis (q.v.). It is employed by jewelers and goldsmiths in the work of soldering, and by other workers on small metallic objects; by the glassblower in making thermometers, barometers and other glass instruments; by the enameler; and indeed wherever it is required to subject a small body to a strong heat. It has undergone a variety of improvements in the hands of the chemist, to whose researches it has proved an excellent auxiliary. Wollaston's portable blowpipe is formed of three pieces fitted into one another when in use, but which may be taken down and made to slide within each other. Most laboratory blowpipes have a hollow bulb or enlarged part at the end, to condense the vapor of the breath. To prevent corrosion from moisture, the bulb is made of silver, sheet-tin or the like. Sometimes two pipes are mounted on a table so that both may be directed on the same object, a bellows under the table furnishing the power. A little practice is necessary to enable the operator to keep up a constant blast for any length of time, the current of air being propelled through the pipe by the muscular exertion of the checks, while respiration is carried on through the nose. But when the process has to be long continued, the current of air is supplied by bellows. This is the form commonly used by glassblowers. The gas blowpipe, commonly called the oxyhydrogen blowpipe, is a very important and intensely powerful variety, whose structure is due to Mr. Newman of London. Sir Humphrey Davy suggested the employment of other gases instead of common air, and Dr. Clarke of Cambridge adopted the suggestion. Dr. Clarke found that a mixture of two volumes of hydrogen and one of oxygen produced an intense heat. These gases are contained in a bladder attached to the end of a pipe which leads into a vertical cylinder, in which is fitted a piston, working through a collar at the top. By the action of this piston the gas from the bladder is compressed into a copper chamber, and thence issues to the flame through an ordinary blowpipe nozzle. To guard against explosions, the gases are kept in separate holders, and by means of valves in the burner are mixed only at the instant of burning. There are various other forms of blowpipe, and many uses to which they may be applied. One of the most unique is the electric blowpipe, which sends a stream of air or gas particles from the point of a charged conductor. For information on the subject consult Plattner, 'On the Blowpipe.'

BLOWPIPE ANALYSIS, a branch of chemical analysis in which the composition of the substance under examination is inferred from its behavior when subjected to certain flame tests. The blowpipe itself commonly consists of a tapering brass tube about eight inches long, provided with a bell-shaped mouthpiece at one end, and at the other with a nozzle that is turned at right angles to the general length of the instrument. The nozzle should be tipped with platinum, and provided with a very minute perforation through which the operator blows a tiny blast of air that drives the flame of his lamp against the object to be analyzed. The flame used in blowpipe work should not be round and colorless, like those of spirit lamps and Bunsen burners, but should be flat and luminous, containing plenty of free, incandescent carbon. A large candle-flame serves very well, although it is not flat. Usually a gas-flame is employed, in connection with a burner formed by flattening a piece of brass tubing, and then cutting it off at the top, at an angle. When the blowpipe is in service its tip is introduced into the flame of the lamp, which the air-blast deflects laterally in the form of a long, almost non-luminous cone, which consists of two visibly different portions. The inner part is somewhat brighter, and is richer in unoxidized gases. The outer layer, being more plentifully supplied with oxygen, consists almost entirely of completely oxidized gases. The outer portion of the blowpipe flame is called the «oxidizing flame,» since this part, when directed against the specimen under examination, heats it while it is in contact with the air, and causes it to oxidize, if it is capable of doing so at the temperature that is attainable by the blowpipe. The inner portion of the flame is called the «reducing flame,» from the fact that when the specimen is exposed to this part, it is heated, not in contact with the air, but while surrounded with an atmosphere of partially unoxidized hydrocarbon gases. Under these circumstances many metallic oxides give up their oxygen to the hot hydrocarbon gases in which they are bathed, and are themselves reduced to the metallic form. If a flame still richer in free carbon and unconsumed hydrocarbons is desired, the tip of the blowpipe is held just outside of the lamp-flame, and a jet of flame with a luminous tip containing particles of solid carbon can easily be thrown down upon the specimen.

In blowpipe analysis there is no recognized «scheme» to be followed out. The method is oftenest used for the determination of minerals, and in such cases the analyst usually has some sort of idea, in advance, of the elements that may possibly be present. The substance to be examined is usually first pulverized, and a portion of it heated in a tube that is open only at the upper end. If it carbonizes, it contains organic matter of some kind, and the odor that is produced is often a good indication as to whether the organic matter is of an animal or vegetable nature. If the substance, when heated in the closed tubes, gives off water which condenses in the upper part of the tube, the moisture so condensed should be tested with litmus paper. If it is neutral, the substance is a hydrated compound, or a hydroxide. An acid reaction indicates acid salts, and an alkaline one may usually be taken to indicate the presence of compounds of ammonia. If the substance melts but does not change its color, it is an alkaline or a hydrated salt. If it melts and turns yellow, remaining yellow even after cooling, it contains oxide of bismuth; while if it melts to a yellow color, but turns red upon cooling, it contains oxide of lead. If it does not melt, but changes color, the indications are as follows: Yellow, both hot and cold, indicates stannic oxide; if yellow while hot, but white when cold, zinc oxide; if black while hot, and reddish-brown when cold, ferric oxide; if black while hot, but bright red when cold, mercuric oxide. If gas is evolved, its nature should be determined. Oxygen may be detected by the kindling of a glowing splinter of wood inserted into the tube; carbon dioxide by its extinguishing such a spark promptly; carbon monoxide by the gas burning with a bluish flame when ignited at the mouth of the tube; sulphur dioxide, ammonia and cyanogen, by the odor. Oxygen indicates chlorates, peroxides, etc.; carbon dioxide indicates carbonates or oxalates; carbon monoxide indicates oxalates or formates; sulphur dioxide indicates certain sulphites or sulphates; cyanogen indicates cyanides; and ammonia indicates some compound of that substance. If the gas is reddish-brown in color, bromides, nitrates or nitrites, are probably present; if it is violet, an iodide is indicated. A sublimate may also be deposited upon the tube. If the sublimate is black, or nearly so, selenium or mercuric sulphide are indicated; if yellow, sulphur or a sulphide; if white, a salt of ammonia or mercury, a volatile organic acid or an oxide of antimony or arsenic. Gray metallic globules indicate mercury, and a metallic mirror may represent either antimony or arsenic.

When the substance is heated in an inclined tube, open at both ends, similar indications are to be observed; modified somewhat, however, by the fact that oxygen can now pass up through the tube and come in contact with the specimen under examination. Thus sulphides are commonly oxidized in the open tube, arsenic will sublime as the trioxide and not as the metal, and selenium gives a sublimate that may be gray or red, and also a strong odor of horseradish.

The color that the specimen communicates to the non-luminous part of the flame is likewise of great service in determinations by the blowpipe. A piece of platinum wire, bent at the end into a small loop, is dipped in hydrochloric acid and held in the flame, this process being repeated several times until the analyst is confident that the wire itself is free from any substance that can color the flame. The little loop at the end is then brought into contact with some of the finely pulverized specimen, and introduced into the flame again. Sodium gives a strong lasting yellow; calcium an orange red; lithium and strontium a crimson; potassium a lavender; barium an apple green; thallium, copper and boracic acid a brighter green; lead and antimony a pale blue; selenium a deep blue. The yellow due to sodium is so powerful, even when that metal is present only in slight amounts, that the colors due to the other metals present are sometimes difficult to observe by the unaided eye. Hence colored glasses are often used, through which to take note of the flame color; the tint of the glass being selected so as to cut off the yellow light of the sodium, while allowing the particular color that is sought to pass through unobstructed. Cobalt blue glass, for example, is used in this way in testing, by flame coloration, for potassium.

When a sample of the specimen to be analyzed is heated upon charcoal, it is often possible to obtain some of the elements that are present, in the form of a metallic bead, by the reduction of their oxides or of the other compounds in which they were originally contained. Lead, tin and silver give beads that are white and malleable; copper gives a malleable red bead; antimony and bismuth give brittle beads; and iron, cobalt and nickel may often be obtained in the form of gray, magnetic powders.

While the substance is being heated upon charcoal, an incrustation commonly forms on the charcoal, from the character of which useful inferences can be drawn. Thus antimony gives a white incrustation; bismuth, an incrustation that is deep yellow when hot and lighter yellow when cold; lead, one that is light yellow when hot and deep yellow when cold, and is surrounded by a white border; arsenic gives a white incrustation that is very volatile; and with zinc the color is yellow when hot and white when cold.

Many metallic oxides are soluble in melted borax, and valuable color indications are obtained by heating small quantities of the substance in little beads of melted borax, that are held in the flame upon tiny loops of platinum wire. The phenomena that are observed in this way are quite complicated, however, and for an account of them the manuals on blowpipe analysis should be consulted. Consult Cornwall, 'Manual of Blowpipe Analysis'; Moses and Parsons, 'Elements of Mineralogy, Crystallography, and Blowpipe Analysis'; Dana, 'Minerals and How to Study Them.'

Charles H. Cochrane.

BLÜCHER, blü-ḣėr, **Gebhard Leberecht von,** (Prince of Wahlstadt, väl'stät), Prussian soldier: b. Rostock, 16 Dec. 1742; d. Krieblowitz, Silesia, 12 Sept. 1819. When 14 years of age he visited the island of Rügen, where the sight of some Swedish hussars aroused a desire to become a soldier, and in spite of the opposition of his parents and relatives he took service in a Swedish regiment as cornet. His first campaign was against the Prussians, and he was taken prisoner by the same regiment of hussars which he afterward commanded. The commander of this regiment, Colonel von Belling, induced him to enter the Prussian service. An exchange was agreed upon with the Swedes, and Blücher was made lieutenant in Belling's regiment. Discontented at the promotion of other officers over his head, he left the army, devoted himself to agriculture, and by industry and prudence acquired an estate. After the death of Frederick II he became a major in his former regiment, which he commanded with distinction on the Rhine 1793–94. Orchies, Luxemburg, Frankenstein, Oppenheim (16 Jan. 1794), Kirrweiler and Edisheim in the Palatinate, bear witness to his achievements. After the battle of Kirrweiler, in 1794, which added greatly to his reputation, he was appointed major-general of the army of observation stationed on the lower Rhine. In 1802, in the name of the King of Prussia, he took possession of Erfurt and Mühlhausen. On 14 Oct.

1806, he fought at the battle of Auerstädt. He then, with the greater part of the cavalry, followed the retreat of the Prince of Hohenlohe to Pomerania. His squadron, moving on the left of the main army, became separated from it, and the Prince of Hohenlohe was forced to surrender at Prenzlau. Blücher, cut off from Stettin by this accident, threw himself into Mecklenburg, where he joined at Dambeck the corps of the Duke of Weimar, commanded by Prince William of Brunswick-Oels. All the troops, however, were too much fatigued to undertake any enterprise. Having the Grand Duke of Berg on his left flank, the Prince of Ponte Corvo in his front and Marshal Soult on his right, Blücher was obliged to take post behind the Trave in order to draw off the three great divisions of the French forces from the Oder as long as possible. With this view he entered the territory of the free city of Lübeck, which was soon stormed by the French. Although Blücher escaped with some troops he was obliged to surrender at Ratkau on 6 November, but with a clause in the capitulation that he «accepted it only from want of ammunition, provisions, and forage.» He was soon exchanged for the French general Victor, and on his arrival at Königsberg was placed at the head of a corps and sent to Swedish Pomerania to share in the defense of Stralsund and to assist the efforts of the Swedes. After the Peace of Tilsit he labored in the Department of War at Königsberg and Berlin. He then received the chief military command in Pomerania, but at the instigation of Napoleon was afterward dismissed from the service. In the campaign of 1812, when the Prussians assisted the French, he took no part; but no sooner did Prussia rise against her oppressors than Blücher, already 70 years old, engaged in the cause with all his former activity. He was appointed commander-in-chief of the Prussian army and the Russian corps under General Winzingerode, which at a later period was separated from him. In 1813 he was created field-marshal. His heroism in the battle of Lützen (2 May 1813) was rewarded by the Emperor Alexander with the order of Saint George. The battles of Bautzen and Hanau, those on the Katzbach (26 Aug. 1813) and Leipzig added to his glory. On the Katzbach Blücher defeated the army of Marshal Macdonald and delivered all Silesia. On 3 October Blücher crossed the Elbe at Wartenburg, and encouraged the Bohemian army under Schwartzenberg, and the northern army under the Crown-Prince of Sweden, to act with more spirit. On 16 October he gained a signal advantage over Marshal Marmont at Möckern, forcing his way as far as the suburbs of Leipzig. On the 18th, in conjunction with the Crown-Prince of Sweden, he contributed greatly to the defeat of the enemy, and on the 19th his troops made the first assault upon Leipzig. His promptitude and peculiar manner of attacking had already procured him from the Russians the name of «Marshal Forward.» On 1 Jan. 1814, with the Silesian army, which now consisted of two Prussian, two Russian, one Hessian and one mixed corps, he crossed the Rhine at Kaub, took possession of Nancy on the 17th, gained (1 February) the battle of La Rothière, and pushed forward toward Paris. His detached corps were, however, checked by Napoleon; yet Blücher, though suffering heavy losses, effected his retreat toward Châlons. He then crossed the Aisne at Soissons, joined the northern army, obtained (9 March) a victory over Napoleon at Laon, and, in connection with Schwartzenberg, at the close of the month, pressed forward to Paris. The day of Montmartre crowned this campaign, and on 31 March Blücher entered the capital of France. For this triumph he was created Prince of Wahlstadt, with a suitable income. In England, whither he followed the allied monarchs in June of the same year, he was received with enthusiasm. He then lived on his estates in Silesia till 1815, when the chief command was again committed to him, and he led his army into the Netherlands. On 15 June Napoleon threw himself upon him, and Blücher, on the 16th, was defeated at Ligny. In this engagement his horse was killed, and he was thrown under his body. In the battle of the 18th Blücher arrived at the most decisive moment upon the ground, and, taking Napoleon in the rear and flank, assisted materially in completing the great victory of Belle Alliance, or Waterloo (q.v.). He refused the proffered armistice and forced Paris to surrender; opposing with energy, on his second conquest of the capital, the system of forbearance practised on the former occasion. As he was already a knight of all the military orders of Europe, the King of Prussia, to reward his new services, created the new order of the Iron Cross expressly for him. After the Peace of Paris he retired to his estate, where he died. On the anniversary of the battle on the Katzbach, a monument commemorating his glory, executed by Schadow in Berlin, was erected at Rostock. On that of Waterloo (18 June 1826) a bronze statue 12 feet in height, modeled by Rauch, was erected to his memory in Berlin. Blücher was not so eminent for military science as for ability in action. His simplicity, good nature and bravery endeared him to his soldiers, who loved him as a father. His addresses and proclamations are distinguished for their brevity, precision and simplicity. Consult ‘Blücher's Life,’ by Varnhagen von Ense (Berlin 1827); Scherr's ‘Blücher's Life and Times’ (Leipzig 1862); and Henderson, ‘Blücher and the Part of Prussia Against Napoleon’ (New York 1911).

BLUE, Victor, American naval officer: b. North Carolina, 6 Dec. 1865. He was graduated at the Naval Academy June 1887, and serving through the grades of ensign and junior lieutenant, was promoted lieutenant 3 March 1899. At the outbreak of the war with Spain he was ordered to the gunboat *Suwanee,* and while on duty off the Cuban coast captured two Spanish patrol sloops having on board a heliographic signal outfit. On 11 June 1898 he landed at Aserraderos, passed through the Spanish lines, proceeded to the hills overlooking Santiago city and harbor, where he located the Spanish fleet commanded by Admiral Cervera. On 25 June he made a further reconnoissance and mapped the position of the Spanish ships. To accomplish these things he traveled a distance of nearly 140 miles, mostly through territory occupied by the intrenchments of the Spanish army. Admiral Sampson highly commended the manner in which these tasks had been performed and recommended that Lieutenant Blue be advanced 10 numbers as a promotion. He was placed in command of the captured gunboat *Alvarado,* and on 12 Aug. 1898 bombarded the fortifications of Manzanillo. Subsequently he served in China and the Philippines, and later as flag lieutenant to Rear-Admiral Kempff in the Philippines during the insurrection 1900–01, and in North China during the Boxer insurrection in 1900; was flag lieutenant to Rear-Adm. Philip H. Cooper, commander-in-chief of the Asiatic fleet, 1903–04. He was promoted lieutenant-commander 1905; commander 1909; and captain 1914; served as executive officer of the *Bennington* and the *North Carolina,* and as commander of the *Yorktown;* chief of staff of the Pacific fleet 1910–11, with Rear-Adm. Chauncey Thomas as commander-in-chief. On duty with the general board of the navy 1911–13, and appointed chief of bureau of navigation, with temporary rank of rear-admiral 1913.

BLUE, one of the seven primary colors, of the same shade as the clear sky and the turquoise, and located in the solar spectrum between the green and the violet. The blue pigments commonly employed by artists are few in number, including native and artificial ultramarine, cobalt, indigo and Prussian blue. Genuine ultramarine, prepared from the mineral lapis lazuli, and ordinary cobalt blue, sold for artists' work, are permanent colors. They are used either alone, or mixed with other pigments, chiefly for skies and distances in landscape, and by themselves, or to make up grays and other mixed tints in figure painting. Owing to the exceptionally high price of real ultramarine, the artificial color, which is of doubtful permanency, is usually substituted for it. Prussian blue and indigo are highly useful colors, since it is only these that yield dark blues, and only from them, mixed with yellows or browns, that strong greens can be obtained. It is unfortunate accordingly that both are more or less fugitive. All the blues above named are used both in oil or water color painting, but indigo less than the others in oil, since it is most apt to fade in that medium.

A number of different names are used in commerce for what is essentially the same pigment, or for pigments closely resembling one another. The following statement gives some explanation of these: Cobalt blues are mixtures of cobalt with earthy or metallic bases, which have been subjected to the action of heat, and have received the following names: Cobalt blue, cerulean blue, royal blue, Dumont's blue, Saxon blue, Thénard's blue, Leithner's blue, Hungary blue, Zaffre or enamel blue, Vienna blue, azure blue and Paris blue. The last name is also applied to a Prussian blue, and azure is also given to a variety of ultramarine blue. Smalt is a powdered cobalt glass used in illumination and flower painting. Artificial ultramarine is also called French ultramarine, French blue, new blue and permanent blue. Coarse qualities of this color are largely used by house painters. Intense blue is a refined indigo. Prussian blue (sesqui-ferrocyanide of iron) is otherwise named Berlin blue, Paris blue and ferrocyanide of iron. The name Paris blue is also given to a cobalt color. Antwerp blue is a variety of Prussian blue made lighter by the addition of an aluminous base, and not so permanent. Blue ochre (hydrated phosphate of iron) is a subdued permanent blue, but not much employed. Blue verditer is a hydrated oxide of copper which changes and ultimately blackens by time. It is used in distemper work and paper staining. Blue was adopted as their distinctive color by the Scottish Covenanters in the 17th century and is the usual color of the uniforms of the soldiers of the United States army for dress uniforms. A dark shade of this color is generally worn by the sailors of most countries, whence the term navy blue is derived. The dyestuffs yielding a blue color are the following: Alizarin blue; aniline blue; anthracene blue; chemic blue, a solution of indigo; Coupier's blue; dahlia blue; diamine blues; ethyline blue; indigo blue, now made synthetically; logwood blue; methylene blue; night blue; resorcine blue; sulphur blues; and Victoria blue.

BLUE, Prussian. See DYES.

BLUE BEECH. See HORNBEAM.

BLUE BOOKS, the official reports, papers and documents printed for the British government to be laid before the Houses of Parliament. They are so called simply from being stitched up in blue paper wrappers, and include bills presented to, and acts passed by, the houses; reports and papers moved for by members or granted by government; reports of committees; statistics of trade, etc. The term is used also in a broad way as descriptive of special reports put forth by the government of any country or its various executive departments. In the United States the published lists of government employees and the navy regulation manual are known as Blue Books and the foreign diplomatic correspondence is commonly issued in Red Books. French official reports, etc., are called Yellow Books; those of Italy are styled Green Books, and those of Spain Red Books.

BLUE BOY, The, a celebrated picture by Gainsborough, dated 1679; its subject, a boy dressed in a blue satin 16th century costume.

BLUE COAT SCHOOL. See CHRIST'S HOSPITAL.

BLUE CROSS FUND, a British organization registered under the War Charities Act and supported by voluntary contributions to perform the same services for horses, dogs and mules on the battlefield as the Red Cross for soldiers. The fund established hospitals in France equipped with veterinary surgeons and staffs, and sent medical and surgical supplies to Italy, Mesopotamia, Salonica and Egypt.

BLUE EARTH, Minn., city, county-seat of Faribault County, on the Blue Earth River, and on the Chicago, Saint Paul, Minneapolis & Omaha Railroad, 130 miles southwest of Saint Paul. Agriculture furnishes the principal industries and the city maintains waterworks, lighting plant and a public library. Pop. 2,319.

BLUE-EYE, a small and favorite species of honey-eater (*Entomyza cyanotis*) with a conspicuous patch of blue about the eyes. It frequents the eucalyptus trees, and has the curious habit of depositing its eggs in a neat depression on the top of the big, oven-shaped nest of a certain starling, whenever it can find a deserted one. Otherwise it constructs a nest for itself. It is numerous in New South Wales. Consult Campbell, 'Nests and Eggs of Australian Birds' (1910), and Gould, 'Birds of Australia' (London 1842–50). See HONEY-EATER.

BLUE FLAG. See IRIS.

BLUE GRASS, KENTUCKY BLUE GRASS, JUNE GRASS, MEADOW GRASS, SPEAR GRASS, a grass (*Poa pratensis*) of the family *Poaceæ,* native of the cooler parts of the northern hemisphere. The plant is a perennial with very numerous rootstocks and long, soft radical leaves. The more or less leafy stems which rise from one to two feet are terminated by a loose pyramidal panicle three to four inches long. Blue grass forms a dense sod, which is very resistant to the trampling of stock, upon soils favorable to its growth, and is ranked as the best pasture and lawn grass throughout its range in districts and upon soils adapted to it. It attains its highest development upon limestone soils, and where found growing naturally, is considered to indicate a superior agricultural soil especially useful for stock raising. The Blue Grass region of Kentucky, which also extends into Tennessee, and from which the former State derives one of its popular names, is of limestone formation, and is noted for its superior, strong-boned, well-formed stock, especially horses. Upon soils other than limestone this grass does not produce so well and upon sandy soils it usually fails. Blue grass hay is of high quality, but is produced in too small amount to pay as well as other hay grasses. The hay cut when the seed is in the milky stage has the following composition: Nitrogen-free extract, 34.3; crude fibre, 24.5; water, 24.3; ash, 7.0; proteid matter, 6.3; fat, 3.6. If the grass be allowed to mature its seed before being cut it is somewhat less nutritive because of the change in the relative proportion of nutrient material to non-digestible matter. The composition of the fresh grass is as follows: Water, 65.1; nitrogen-free extracts, 17.6; crude fibre, 9.1; proteid matter, 4.1; ash, 2.8; fat, 1.3. Blue grass may be propagated by sowing seed or by setting out pieces of sod. Since the seed of Kentucky blue grass is often of low vitality, and is frequently mixed with chaff, it should be sown rather thickly. A permanent blue grass pasture requires about three years to become established, after which, without much attention, beyond ordinary fertilizing, it may remain profitable for half a century or more. In long settled districts there are occasional pastures of more than 75 years standing.

BLUE GRASS STATE, popular name for Kentucky.

BLUE-GREEN ALGÆ. See CYANOPHYCEÆ.

BLUE-HEN STATE, popular name for Delaware. During the War for Independence, a certain popular officer of Delaware, named Captain Caldwell, asserted that a game cock to be unconquerable must be «a blue hen's chicken.» This name was at once applied to his regiment and later to the State and its people.

BLUE HILL OBSERVATORY, near Boston, Mass., a meteorological observatory at the summit of the Great Blue Hill, altitude 635 feet, founded by A. Lawrence Rotch in 1885, and maintained by him until his death in 1912, when the observatory and grounds became the property of Harvard University. The work done by the observatory in furnishing continuous weather records is of incalculable value. The records and the results of the investigations are published in 'Annals of the Observatory of Harvard College.' Consult Rotch, A. L., 'Sounding the Ocean of Air' (1900).

BLUE ISLAND, Ill., city of Cook County, situated on the Calumet River and on the Illinois Central, the Chicago, Rock Island & Pacific, the Chicago & Grand Trunk and the Chicago & Chicago Terminal railroads. It forms a southern suburb of Chicago, about two miles south of the city limits, and is an important manufacturing, commercial and railroad centre. Among its industries are brick-making, stone-quarrying, etc. There are also smelting works, oil works and breweries. It was settled in 1833 and incorporated in 1872. Here in 1894 started the strike of railroad employees, which tied up the traffic of half the country and was quelled only by the prompt action of President Cleveland in sending United States troops there. The municipal organization provides for a mayor with a term of two years, and a city council. The city operates its own waterworks and electric-light system. Pop. (1920) 11,424.

BLUE JAY. See JAY.

BLUE JOHN, a name for fluorite or fluorspar (q.v.).

BLUE LAWS, a term generally applied to any laws which impose vexatious restrictions and interfere with the ordinary life of a community, or which seek to regulate the private morals of the members of the community; the name is especially applied to the early enactments of several of the New England colonies, but more frequently limited to the laws of New Haven colony. The origin of the term is not exactly known. Various conjectures have been made, but the most probable derivation is that given by Professor Kingsley, who thinks the epithet «blue» was applied to any one who immediately after the Restoration of the Stuarts looked with disapprobation on the licentiousness of the times. Thus, in Hudibras,

For his religion, it was fit
To match his learning and his wit;
'Twas Presbyterian true *blue.*

That this epithet should find its way to the colonies was a matter of course. It was here applied not only to persons, but to the customs, institutions and laws of the Puritans, by those who wished to render the prevailing system ridiculous. Hence, probably, a belief with some that a distinct system of laws, known as the blue laws, must somewhere have had a local habitation. The existence of such a code of blue laws is fully disproved. The only authority in its favor is Rev. Samuel Peters, whose 'General History of Connecticut' (1781) is a spiteful, satirical work, full of exaggerations. The traditions upon this subject, from which Peters framed his stories, undoubtedly arose from the fact that the early settlers of New Haven were uncommonly strict in their application of the «general rules of righteousness.» Judge Smith, in his continuation of the history of New York, published in 'New York Historical Collections' (Vol. IV), gives evidence against the existence of the blue laws, which is particularly valuable, as it was put on record some 15 years before Peters' history was published. He writes: «Few there are who speak of the blue laws (a title of the origin of which the author is ignorant), who do not imagine they form a code of rules drawn up for future conduct, by an enthusiastic, precise set of religionists; and if the inventions of wits, humorists, and buffoons were to be credited, they must consist of many large volumes. The author had the curiosity to resort to them when the commissioners met at New Haven for adjusting a partition line between New York and Massachusetts in 1767; and a parchment covered book of demi-royal paper was handed him for the laws asked for, as the only volume in the office passing under this odd title. It contains the memorials of the first establishment of the colony, which consisted of persons who had wandered beyond the limits of the old charter of Massachusetts Bay, and who, as yet unauthorized by the Crown to set up any civil government in due form of law, resolved to conduct themselves by the Bible. As a necessary consequence, the judges they chose took up an authority which every religious man exercises over his own children and domestics. Hence their attention to the morals of the people in instances with which the civil magistrate can never intermeddle in a regular well-policied constitution, because to preserve liberty they are recognizable only by parental authority.» Recent investigations, however, show that while many of the 45 statutes cited by Peters were not on the books of the New Haven colony, all except two or three are to be found, with slight modifications, among the codes of the various New England colonies. Consult Trumbull, J. H., 'True Blue Laws of Connecticut and New Haven, and the False Blue Laws Invented by Rev. Samuel Peters' (Hartford 1876); Prince, 'An Examination of Peters' Blue Laws,' in Annual Report of the American Historical Association for 1898.

BLUE LIGHT. See Bengal Light.

BLUE-LIGHT FEDERALISTS, a term applied to the party in American politics which opposed the War of 1812. In 1813 Decatur made several attempts on dark nights to escape from the blockaded port of New London, Conn. He declared that his failure was due to signals of blue lights flashed from the shore to warn the British. This led to the opponents of the war, who were accused of having shown the lights, being stigmatized as «Blue-light Federalists.»

BLUE LODGES, a secret association of advocates of slavery, organized about 1854, in Missouri, for the purpose of aiding the work of establishing slavery in Kansas. The members of the order, although citizens of Missouri, crossed into Kansas in 1855 and forcibly deposited their ballots for the pro-slavery candidates.

BLUE-MANTLE, one of the English pursuivants at arms, connected with the Heralds' College, so styled from the color of his robe.

BLUE-MASS. See Mercury.

BLUE MONDAY, a name formerly given in Europe to the Monday before Lent, when the churches were decorated with blue. It was kept as a holiday by classes whose ordinary avocation required them to labor on Sundays. As this led to violent disturbances and excesses the custom was legally abolished. The term now signifies a Monday of depression, or blue spirits, particularly among clergymen, but is very loosely used, and by hard-working persons is applied to Monday in general.

BLUE MOUNTAINS, (1) a beautiful wooded range of mountains in Oregon, from 8,000 to 9,000 feet high, which, with the Powder River Mountains, separate the Columbia River Valley from the Great Basin; there are great forests of fir and pine on their slopes; (2) a mountain chain of New South Wales, part of the great Dividing Range, is made up of sandstone strata interspersed by canyons and gullies and with a precipitous east front. The highest peak is Mount Beemarang, which attains an elevation of 4,100 feet above sea-level. The range is now traversed by a railway, which attains a maximum height of 3,494 feet and connects Sydney with the rich grazing and mining regions of the inland; (3) the Central Mountain Range of Jamaica, the main ridges of which rise to 8,000 feet; (4) the second main ridge of the Appalachians, known also as the Kittatinny Mountains in Pennsylvania, as the Shawangunks in New York. This range should not be confounded with the Blue Ridge (q.v.).

BLUE NILE. See Nile.

BLUE NOSE, a popular nickname for a native of Nova Scotia, from the effect of the climate or from a potato called «Blue Nose» raised in that region.

BLUE PETER, a blue flag having a white square in the centre, used to signify that the ship on which it is hoisted is about to sail, and for recalling boats. The term is a corruption of Blue repeater, one of the signal flags in the British code. A flag known as the cornet is used as a sailing signal in the United States instead of the blue peter.

BLUE-PILL. See Mercury.

BLUE POINT, N. Y., the southern extremity of Patchogue Bay, Long Island, which lends its name to the well-known oysters, Blue Points.

BLUE PRINT, or **CYANOTYPE PROCESS,** a method discovered by Sir John Herschel whereby photographic pictures are obtained by the use of a cyanide. It is based on the reduction of ferric to ferrous salts by light, when they are in contact with organic matter. This process is in common use by architects and engineers for copying plans, producing an image with white lines on a blue ground. Paper is made sensitive by brushing it over with a solution of ferric oxalate (10 grains to the ounce); it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate. The details of the process have been varied in many ways.

BLUE RAPIDS, Kan., city of Marshall County, on the Missouri Pacific and the Union Pacific railroads, 65 miles northwest of Topeka.

It contains a high school and a grade school, an opera-house, and two banks with aggregate resources in excess of $500,000. The value of the city's taxable property is estimated at $1,200,000. There are three establishments engaged in the manufacture of wall plaster. The government is vested in a mayor and a city council. Pop. 1,756.

BLUE-RIBBON ARMY, the name of an English total abstinence society, so called from the color of the membership badge. The organization grew out of the Murphy Movement in America and dates from 1878. About five years later the Society became known as the Gospel Temperance Union. See TEMPERANCE SOCIETIES.

BLUE RIDGE, the most easterly ridge of the Alleghany or Appalachian Mountains, which extends from the Hudson River southwest to Georgia. It first receives the name of Blue Ridge when it enters Virginia, the western portion of which it traverses. In south Virginia, the range becomes a broad plateau, which is at its widest in North Carolina, and is here crossed by the Black, Cowee, Nantahala and South mountains, extending transversely to the axis of the Blue Ridge. The highest peaks of the range occur in the Black Mountain group, where are found Mount Mitchell or Black Dome, 6,710 feet; Guyot's Peak, Sandoz Knob, Gibbe's Peak and a few others over 6,000 feet. In Virginia the Blue Ridge nowhere rises much above 4,000 feet and in Pennsylvania and New Jersey its height is much less. Several large rivers pierce the ridge, such as the Hudson in the Highlands, the Delaware at the Water Gap and the Potomac at Harper's Ferry. See also APPALACHIANS.

BLUE SKY LAWS. This term is applied to certain statutes which have been enacted in a majority of the United States for the protection of investors. They are designed chiefly to regulate the sale of stocks, bonds and other securities, but in practice their application has been extended to a wide range of investment enterprises. Thus, in North Carolina, a corporation which sold fig orchards was held to be within the statute, which by its terms applies to any foreign corporation or company selling stocks, bonds or other evidences of property within the State.

These statutes, while differing from each other in many details, are very much alike in their essential features. They usually contain a penal clause, prescribing a penalty for fraud in the sale or negotiation of securities, and vest in a certain State official or body, such as the insurance commissioner or a corporation commission, the power to investigate all transactions of this character for the purpose of uncovering fraud or questionable methods in any promotion. Persons or corporations desiring to sell securities within the State are further required, as a rule, to file with the proper authorities a statement under oath, containing a list of such securities, with specific information concerning them, and in some States a license must be obtained upon the payment of a stated fee.

The first blue sky law in the United States was enacted in 1911, by the Kansas legislature, and nearly all similar statutes subsequently passed in other States were modeled after this one. The term «blue sky law» is said to have originated in a remark made by a member of the Kansas legislative committee having the subject under consideration, who is quoted as saying that the restriction to be placed on investment concerns should be as far-reaching as the blue sky. Blue sky laws have been enacted and are now in force in the following States of the Union: Arizona, Arkansas, California, Connecticut, Florida, Georgia, Idaho, Iowa, Kansas, Louisiana, Maine, Minnesota, Mississippi, Missouri, Montana, Nebraska, North Carolina, North Dakota, Oregon, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, West Virginia and Wisconsin. The New York Banking Act is sometimes referred to as a blue sky law, but it does not strictly belong in this category.

Because of the extreme rigor which characterized the earlier restrictive measures of this class, they were vigorously assailed by banking and investment interests on constitutional grounds. The 1913 enactments of Iowa, Michigan and West Virginia were declared unconstitutional by the Federal District Courts. As a result of such adjudication, objectionable blue sky laws were repealed and new ones enacted in 1915 by the legislatures of Arkansas, Iowa, Kansas, Michigan, North Dakota, Oregon, South Carolina, South Dakota and West Virginia. The following year, however, the new Michigan law was held invalid as impressing upon interstate commerce a direct burden which was beyond the limits of the police power. The same year the blue sky laws of Ohio and South Dakota were declared unconstitutional. In January 1917 the Supreme Court of the United States upheld as constitutional the blue sky laws of Ohio, Michigan and South Dakota. The decision affected similar laws in 26 States, which had been held in abeyance pending the decision, which held that «Prevention of deception is within the competency of government. The intangibility of securities, being representatives of property in distant States and the integrity of them can only be assumed by the probity of the dealers in them and the information they are required to give. This assurance the States deemed necessary for their welfare to require, and that requirement is not unreasonable or inappropriate.

«We cannot stay the hands of government upon a consideration of the impolicy of its legislation. Every new regulation of business meets challenge. But the policy of a State and its expression in laws must vary with circumstances.

«The statutes burden honest business, it is true, but burden it only that under its forms dishonest business may not be done. Expense may thereby be caused and inconvenience, but to arrest the power of the State by such considerations would make it impotent to discharge its functions. It costs something to be governed.»

BLUE-STOCKING, a pedantic woman; a lady regarded as too fond of learning. The origin of this name is thus given by Boswell in his 'Life of Johnson': «About this time (1780) it was much the fashion for several ladies to have evening assemblies where the fair sex might participate in conversation with literary and ingenious men, animated with a desire to please. These societies were denominated blue-stocking clubs, the origin of which name was as follows: One of the most eminent members of these societies was Mr. Stillingfleet, who always wore blue stockings. Such was the excellence of his conversation, that his absence was felt as a great loss, and it used to be said, 'We can do nothing without the blue stockings'; and thus by degrees the title was established." One of the most famous of these clubs was that which met at Mrs. Montague's. This was sometimes honored by the presence of Dr. Johnson, and its principal members have been sketched and eulogized by Hannah More, in her poem entitled the 'Bas Bleu.' An account of these assemblies is contained in the 'Memoirs of Elizabeth Carter' (London 1816). Consult Tobban, 'The Blue-Stockings' (in *Blackwood's Magazine,* Vol. CLXXX, London 1906).

BLUE-STONE, or **BLUE-VITRIOL,** the commercial name for copper sulphate. See COPPER.

BLUE THISTLE. See BUGLOSS.

BLUE-VITRIOL, called also **BLUE-STONE,** the salt sulphate of copper, composed of sulphuric acid, oxide of copper and water. It is a natural product of some mines of copper ores, and is also largely prepared for economical purposes. See COPPER.

BLUEBACK, the salmon of the Fraser River, B. C., one of the most valuable of the Pacific salmon. The name is given to various other fishes having bluish backs. See SALMON.

BLUEBEARD, a famous hero of legend and folklore, familiarized to English readers in the 18th century through a translation from the French of Charles Perrault, 1697. According to the story, the Chevalier Raoul, whose surname is due to the color of his beard, had married seven wives, six of whom had disappeared mysteriously. The seventh is put to a strange test of obedience. Having to go away, Raoul gives her the castle keys, and grants her free access to all parts of the castle except one chamber. She disobeys and on opening the forbidden chamber is horrified by seeing the bones of her predecessors. Raoul discovers her disobedience and is about to put her to death when she is rescued by her kinsmen, who slay Bluebeard. This tale of Bluebeard has been regarded by some as partly historic, of which the original was Gilles de Laval, Baron de Retz, who was burned at Nantes in 1440 for his cruelty to children, whom he is supposed to have enticed into his castle, where he sacrificed them to the devil. It is, however, really a märchen, and the leading idea of curiosity punished is world-wide. The forbidden chamber is a counterpart of the treasure-house of Ixion, on entering which the intruder was destroyed, or betrayed by the gold or blood that clung to him; also of Pandora's box, as well as of Proserpine's pyx that Psyche opened in spite of the prohibition. There are several parallels among the German fairy-tales collected by Grimm; and one feature at least is found in the Kaffir tale of the Ox (Callaway's 'Nursery Tales of the Zulus').. Variants are found in Russia, and among Gaelic popular tales; and in the Sanskrit collection 'Katha Sarit Sagara' the hero Saktideva breaks the taboo, and, like Bluebeard's wife, is confronted with the horrible sight of dead women. Possibly in the punishment following the breaking of the taboo may be a survival of some ancient religious prohibition; among the Australians, Greeks and Labrador Indians, such an error was regarded as the means by which death came into the world. Frescoes of the 13th century have been found in Morbihan, Brittany, representing scenes from the similar legend of Saint Trophime. Tales similar to that related by Perrault are found in Straparola's 'Piacevoli Notti' (1569), and in Abbatutis' 'Il Pentamerone,' while a not very dissimilar tale is that of the Third Calendar in the 'Arabian Nights Entertainment.' Operas founded upon it are Grétry's 'Raoul Barbe-Bleue' (1789); Offenbach's 'Barbe-Bleue' (1866). The younger Coleman brought out 'Bluebeard; or, Female Curiosity' (1798). Consult Abbé Bossard, 'Gilles de Rais dit Barbe-Bleue' (Paris 1886); Hartland, "The Forbidden Chamber," in *Folklore Journal* (London 1885); Perrault, 'Contes de ma mère l'Oye' (Paris 1875); Wilson, 'Bluebeard: A Contribution to History and Folklore' (New York 1899).

BLUEBELL, BELLFLOWER, HAIRBELL or **HAREBELL,** *Campanula rotundifolia,* a plant of the natural order *Campanulaceæ,* native of the colder parts of the northern hemisphere. Its common name is suggested by the shape and color of its flowers, and its specific name from the shape of its root-leaves. The stem leaves are lanceolate or otherwise than round. This is the bluebell of Scotland and of literature. It may be found peeping through the snow and ice which are supposed to be melted by the self-generated heat of these little plants. They have long been favorites in the hardy flower border and are of simplest culture. (See also CAMPANULA). The name is also applied to a species of Scilla (q.v.).

BLUEBERRY. See VACCINIUM.

BLUEBILL, one of the most common of American fresh-water ducks, which breeds throughout Alaska and the northern part of Canada generally, spending the cold months in the United States, but going only as far south as is necessary to avoid the freezing of the lakes and ponds. The head, neck and fore part of the body of the drake are black, the head with a green gloss. The back and sides are whitish with finely waved blackish markings. The abdomen and speculum of the wing are white. In the female the head and anterior parts are brown and the face pure white. The most distinguishing part of the bird is the very broad, spatulate bill, which is light blue, with a black nail. Hence the other names "broadbill" and "scaup duck." There are two species, the larger (*Aythya marila nearctica*) the one just described, which is regarded as a variety of the European scaup ducks; and the lesser (*A. affinis*), which is very similar to the preceding, but smaller, and rather more southerly in its distribution. These ducks are close relatives of the canvasback and redhead (qq.v.), and resemble them in habits. Other local names for them are "blackheads" and "shuffler."

BLUEBIRD, or the North American thrush, is widely distributed throughout the United States, where it holds a similar place, in the hearts of the people, as the redbreast in England. In fact, locally, it is sometimes termed “blue-robin.” It is a smaller bird than the rest of the thrushes. Its whole upper parts are sky blue, shot with purple, with its throat, neck, breast and sides reddish chestnut, and part of its wings and its tail feathers black. The “soft and agreeable warble” of the bluebird is one of the first and most welcome sounds of bird-music that we hear in the early spring. The male is remarkably attentive to his more protectively colored mate, and takes exuberant pride in their five or six pale-blue eggs, laid in holes in the trees of gardens, and often also in bird-boxes, and in the crevices in the walls of outbuildings. There are often two broods in a season. The bluebird fights hard to protect his small, neatly constructed nest from the house-sparrow, swallows, wrens and other birds which make his life miserable by their intrusion on his domestic privacy. Several other sorts of birds, of other countries, prevailing blue in color, receive the name “bluebird,” such as the “Oriental fairy-bluebirds” of the genus *Irena*, more particularly *Irena puella*, one of the East Indian bulbuls.

BLUEBIRD, The (‘l'Oiseau bleu’). The most generally acceptable play of Maurice Maeterlinck is ‘The Bluebird,’ which, since its first appearance in 1908, has achieved wide success upon the stage. Although it lacks the qualities for which its author is best known, and especially his dreamy, suggestive evocation of inarticulate fears, it is representative of a new tendency in the theatre. It is pictorial and symbolic, narrational rather than dramatic. As a piece of symbolism it should not be taken too seriously. Perhaps the acute critic may be justified in perceiving here certain correspondences to the doctrines of Swedenborg, but it is doubtful if Maeterlinck had any more definite intention than to tell a pretty story in spectacle and fairy-tale talk, and to indicate that those who engage in a quest for happiness are likely, after all their far wanderings, to find what they seek at home in an act of unselfishness. The humble Mityl and Tyltyl who dream of roving through the land of Memory, the realm of Night, and the Kingdom of the Future, accompanied by Light, the Cat, and the Dog, and the souls of Fire, Bread, Sugar, and Milk, hunting for the bird that is ever blue, fail to discover it, although birds blue at first sight appear here and there. It is only when Tyltyl assents to the request of a neighbor that he give his turtle dove to her sick child that he captures true happiness for a moment. His dove turns deeply blue, yet flies away, leaving Tyltyl to ask its return of the audience. Delicate humor and insight into the nature of children mark this fantasy, which has been translated into English by A. Teixeira de Mattos (1909). Discussions of the play appear in the treatises upon Maeterlinck by Gerard Harry, M. J. Moses, Edward Thomas, Una Clark, and with fullest detail in ‘Maeterlinck's Symbolism’ (1911), by Henry Rose.

Frank W. Chandler.

BLUEBOTTLE FLY, a greenish-blue fly, sometimes called by English authors “greenbottle” fly (*Lucilia cæsar*). It closely resembles the blow-fly (q.v.), but is smaller and entirely blue or green. These flies hibernate through the winter, appearing early in spring. Its eggs are deposited upon meat and decaying animal matter. The larvæ are said to be indistinguishable from those of the blow-fly. They are white, footless maggots, of an elongated conical shape, which transform in the ground. It is said that bluebottle flies do not commonly enter houses.

BLUEFIELD, W. Va., city of Mercer County, on the Norfolk and Western Railroad, 105 miles west of Roanoke, Va. First settled in 1888 it received a charter of incorporation in 1893. It is the commercial centre of the great Pocahontas Coal Field, to the development of which its rapid growth is due, as well as to the exploitation of the iron-ore, lumber, limestone and clay of the surrounding region. Large deposits of manganese have been discovered near Bluefield. Besides its valuable coal-mining and allied interests, it has extensive railway shops, flouring mills and large wholesale distributing houses. A progressive city, its principal institutions include a handsome Federal building, State normal school, high school, opera house and sanitariums. Bluefield early adopted the commission form of government and from a population in 1890 of 1,775, it increased in 1918 to 16,000.

BLUEFIELDS (formerly written Blewfields), Nicaragua, town on the Caribbean coast and at the mouth of the Escondido or Bluefields River, in the department of Chontales. Lat 12° N., long. 83° 44′ W. It was the capital of Mosquitia (see Central America). In the latter part of 1847 the population was about 600, one-sixth white, five-sixths black. Slavery was abolished in 1841. The King of Mosquitia, who resided here in one of the few houses built of boards, claimed sovereignty over a territory 235 miles wide and 340 miles long; also the districts of Talamanca and Chiriqui in Costa Rica. A British agent and consul-general also was stationed at Bluefields, the English government maintaining a protectorate over the Mosquito Indians until 1860. A German colony at Carlsruhe, adjoining Bluefields, was founded in 1844, but abandoned in 1849. The climate is moist and hotter than in the interior. The town is the shipping centre of an important fruit trade, principally bananas. It has steamship communication with the United States and is the seat of a consular agency of the United States. Pop. 4,706.

BLUEFIN, or **BLACKFIN**, a large cisco-like whitefish (*Argyrosomus nigripinnis*) of the deep waters of Lake Michigan and some other of the lakes of Wisconsin, Minnesota and New York, readily known from other species by its black fins.

BLUEFISH. The bluefish or “skipjack” (*Pomatomus saltatrix*) is one of the most widely distributed and abundant of sea-fishes, being found in the Atlantic from the Mediterranean and Nova Scotia to Brazil, and in the Pacific and Indian oceans. It is taken casually at all seasons on the eastern coast of the United States, but becomes numerous irregularly in summer, when its presence or absence seems to be governed largely by the movements of its principal food, the menhaden (q.v.), when seeking their inshore spawning-grounds. The only wonder is that both have not been exterminated many centuries ago, for of all the butchers of the sea the bluefish is the most wolfish and diabolical, snapping its prey in half for a mouthful and passing on in ruthless industry. Little is known as to their method of reproduction. They do not spawn in inshore waters of the United States and their real spawning grounds are unknown. It is beautifully shaped for swimming, built with the fine lines of the mackerel and the strength of the salmon. It is a near relative of the pompanos and horse-mackerels (family *Carangidæ*), but is set apart in a family (*Pomatomidæ*) by itself, which Jordan considers an offshoot toward the pericoids. In color it is steel-blue, and its flesh is very sweet and savory. The weight varies, five pounds being the common run, although 20 pounds are recorded.

The favorite method of fishing for it is «squidding,» or casting from a platform built out into the surf, with a rod and line armed with a spoon, or a bone-baited hook. Its voracity makes it a free biter, and its temperament makes it a fierce one, so that the angler may expect a fight from the strike to the death, and only by sheer strength can the prey be landed. The bluefish is also trolled for from boats, especially in Florida, and off the south coast of New England.

On our Pacific coast the «California bluefish» (*Cynoscion parvipinnis*) is found from Santa Barbara to Guaymas and Mazatlan, and is a near relative of the eastern weakfish (q.v.), locally called «totuava» (*Cynoscion macdonaldi*). In the Gulf of California it congregates at the mouth of the Colorado River and attains enormous size, having been taken in hand-lines as high as 170 pounds. Like other species of this genus, it is erroneously yet frequently called «sea-bass.» The bluefish thrives on sardines and other small fish and destroys certain varieties of annelids and quantities of squid. The diminution of these and of other gregarious fishes constitutes an impartant factor in maintaining the balance of the various species. The bluefish sometimes ascend large rivers as far as the tide sets. It is one of the very best table fish, about $300,000 worth being handled annually in New York.

Consult Cunningham, ‹Natural History of Marketable Marine Fishes› (New York 1896); McFarland, ‹A History of New England Fisheries› (New York 1911); Herubel, ‹Sea Fisheries› (London 1912); Jordan and Evermann, ‹Food and Game Fishes of America› (1902); Goode, ‹Fishery Industries, Section 1› (10th census, Washington 1884); Mayer (editor), ‹Sport with Rod and Gun› (1892).

BLUEGOWNS, an order of paupers in Scotland, called also the «King's Bedesmen,» to whom the kings annually distributed certain alms on condition of their praying for the royal welfare. Their number was equal to the number of years the king had lived. On the king's birthday the bedesmen were each given a blue gown or cloak, a purse containing as many shillings Scots (pennies sterling) as the years of the king's age, and a badge bearing the words «Pass and repass,» which protected them from all laws against mendicity. Edie Ochiltree, who figures prominently in Scott's novel ‹The Antiquary,› is a type of the class, but probably a favorable specimen as compared to those who were to be met with in real life. The practice of appointing bedesmen was discontinued in 1833, and the last of them drew his last allowance from the exchequer in Edinburgh in May 1863.

BLUETHROAT, an Old World bird related to the European robin, and deriving its name from its bright blue throat, which is separated from the white below it by crescent-shaped bands of rust-red and white. It is one of the most highly migratory birds known, spending its winters in tropical Africa and India, and during the summer breeding in Scandinavia, northern Russia, Siberia and western Alaska. It makes its nest in bushes and weeds along streams, as far north as 71 degrees. It is extraordinary in that it is never seen in the intermediate countries, between its summer and winter homes, so that it stands to reason that the journey is made at a single flight, either at night, or at an invisible altitude. The blue-throat is celebrated for its fine singing and powers of mimicry when in its summer home, on account of which the Laplanders call it «the bird of the hundred voices.» It was formerly assigned to the genus *Cyanecula,* but is now included with the nightingale in the group *Luscinia.* Two species are known, one with a white spot in the centre of the blue (*Luscinia leucocyanea*), and the other (*L. suecica*), with a red patch in the centre of the blue. Consult Gätke, ‹Birds of the Heligoland› (English translation 1895); and works on European, Siberian and Alaskan ornithology.

BLUEWING, a duck. See TEAL.

BLUFFS, a term of American origin, synonymous with cliffs. It has long been used to designate the high cliffs met with along the Mississippi River; particularly those abrupt banks of loam on its eastern side below the mouth of the Ohio. These are continually washed and undermined by the action of the river, while the opposite side, rising more gently back from the river, is but slightly washed by its waters. On the south shore of Lake Superior, near the Pictured Rocks, is a most remarkable bluff of loose, blowing sand, which rises so steeply from the edge of the water to the height of 200 feet, that one would in vain endeavor to ascend it. The waves and the winds beat against it from the north, and keep its materials continually in motion; but more sand appears to be always supplied to replace that which is borne away.

BLUFFTON, Ind., city, county-seat of Wells County, on the Wabash River, and on the Lake Erie and Western, the Toledo, Saint Louis and Kansas City and other railroads, 25 miles south of Fort Wayne. It is the centre of a farming and lumber trade with allied industries, has municipal water works and electric-lighting plants, and is administered by a mayor and council. Bluffton was settled in 1837 and incorporated in 1849. Pop. 5,391.

BLUING, a compound dissolved in water and used to neutralize the yellow tinge of white clothes, but also for sugar and other food products. The indigo preparations once largely used have been extensively superseded by Prussian and coal-tar blues.

BLUING OF METALS, the process of giving a blue color to metallic substances by heat. Iron, when heated, becomes first of a light, then of a darker gold color, and finally blue. Steel heated to redness and suddenly cooled is rendered hard and brittle. It is restored to any degree of softness, by heating it up to certain temperatures and allowing it to cool slowly. These temperatures are precisely indicated by the color of the film of oxide which forms upon its surface. At 430° F. it is straw yellow of the very hard temper suitable for lancets. At higher temperatures it appears successively a golden yellow, then brown, purple, blue and finally green. Pale blue at 550° is the temper for swords and watch springs. The common shade of blue, at 560°, is the temper for fine saws and dirks. Deep blue, at 600°, is the soft quality of steel for large saws.

BLUM, blŭn, **Ernest,** French dramatist: b. Paris, 15 Aug. 1836; d. 1907. He made his début in 1852 with ‘Une femme qui mord.’ He was successively connected with *Charivari, Rappel, Gaulois* and other publications. Several of his dramatic works were written in collaboration with Clairville, Flan, Monnier, Brisbarre, Labiche, etc. The drama of ‘Rose Michel’ (1877), of his own composition, ensured his place among the most successful French dramatists of the time. Among his later compositions are ‘Adam and Eve’ (1886); ‘The Nervous Woman’ (1888); ‘End of the Century’ (1890); ‘La rieuse’ (1894); ‘Le Carillon’ (1897); ‘Un soir d'hiver’ (1903); ‘Le jeu de l'amour et de la roulette’ (1905).

BLUM, bloom, **Hans,** German publicist: b. Leipzig 1841; d. 1910. He was a son of Robert Blum, was educated in the universities of Leipzig and Bern, sat in the North German Reichstag 1867–70, and was a barrister in Leipzig 1869–97. In the Franco-Prussian War he served in the field as correspondent for *Daheim* and edited the *Grenzboten* from 1871 to 1879. He wrote extensively on contemporary politics and among his works are ‘Die Lügen unserer Socialdemokratie’ (1891); ‘Fürst Bismarck und seine Zeit’ (1894–95); ‘Das erste Vierteljahrhundert des deutschen Reichs’ (1896); ‘Persönliche Erinnerungen an den Fürsten Bismarck’ (1910); ‘Aus dem tollen Jahr’ (1901), dealing with the revolution of 1848; dramas, short stories and novels, of which ‘Bernhard von Weimar’ is the most remarkable.

BLUM, Robert, German patriot: b. Cologne, 10 Nov. 1807; d. Vienna, 9 Nov. 1848. He served for a short time in the army, and became subsequently connected with the Leipzig Theatre, of which he acted for some time as secretary and treasurer. He founded the Schillerverein at Leipzig in 1840 and within the next few years was established as a bookseller and publisher there. About the year 1840 he began to come prominently forward as the champion of the Liberal cause and acquired much renown as a popular orator. On the outbreak of the commotions of 1848 he manifested great enthusiasm and became soon the rallying-point of democracy in Saxony and the leading member of opposition in the National Assembly at Frankfort, to which he was sent that year as member for Leipzig. The events of October at Vienna inspired him with fresh energy and he proceeded thither at the head of a deputation to express the sympathy of the German democrats in the Frankfort Assembly with the Viennese. He took an active part in the conflict of the citizens with the imperialists; but on the surrender of the capital to Windischgrätz, was arrested with several of his companions on 4 November. Brought before a military tribunal, he pleaded in vain his privileges as a deputy from the German Diet and was condemned to be hanged, a sentence which was changed to death by the bullet. Consult Blum, Hans, ‘Robert Blum’ (Leipzig 1878).

BLUM, Robert Frederick, American artist: b. Cincinnati, Ohio, 9 July 1857; d. 1903. He became a lithographer's apprentice and attended night classes at a school of design in Cincinnati. He also studied at the Pennsylvania Academy of Fine Arts. In 1879 he removed to New York and became one of the illustrators of *Scribner's Magazine.* After 1880 he made many annual trips to Europe. He visited Japan in 1890 and spent three years in that country. Many fine pastels are the fruit of this period. He became a National Academician in 1892. His best known work in oil is ‘The Venetian Beadstringers’ (1889), now in the Cincinnati Museum. In 1913 an exhibition of his works was held in New York and included the ‘Ameya,’ now in the Metropolitan Museum. Blum excelled as a pastellist and watercolorist. Consult *The Studio* (Winter Number 1900–01) and *The International Studio* (Vol. XXI, 1903).

BLUME, Clemens, German hymnologist: b. Billerbeck, Westphalia, 31 Jan. 1862. He was educated at the Jesuit Gymnasium, Feldkirch, Austria, Jesuit scholasticates in Holland and England and the universities of Prague and Bonn. He entered the Society of Jesus in 1878, was gymnasium professor at Feldkirch in 1887–90 and ordained priest in 1893. He has devoted himself to hymnological research, visiting most of the libraries of Europe since 1906. With Guido M. Dreves, he was coeditor of ‘Analecta Hymnica medii ævi’ (1896–1905), and editor of ‘Analecta Hymnica medii ævi’ (to consist of 57 volumes, of which 53 have appeared, Leipzig 1886–1917). He is author of ‘Das Apostolische Glaubensbekenntnis’ (1893); ‘Repertorium Repertorii oder kritischer Wegweiser durch Ul. Chevalier's Repertorium Hymnologicum’ (1901); ‘Wolstan von Winchester und Vital von Saint Evroult’ (1903); ‘Cursus S. Benedicti Nursini und die liturgische Hymnen des 6.—9. Jahrhunderts’ (1908); ‘Ein Jahrtausend lateinischer Hymnendichtung’; ‘Eine Blutenlese aus den Analecta Hymnica’ (1909); ‘Ursprung des Ambrosianischen Lobgesanges’ (1912). He collaborated in Buchberger's ‘Kirchliches Handlexikon’ and contributed to ‘Stimmen aus Maria-Laach,’ *Die Kirchenmusik* and the ‘Catholic Encyclopedia.’

BLUMENBACH, bloo'mĕn-baH, **Johann Friedrich,** German naturalist of distinction: b. Gotha, 11 May 1752; d. Göttingen, 22 Jan. 1840. He studied at Jena and Göttingen, and was appointed in the latter, in 1776, extraordinary professor of medicine and inspector of the museum of natural history, and in 1778 ordinary professor. In 1812 he was appointed secretary to the Royal Society of Sciences at Göttingen, in 1816 became physician to the King of Great Britain and Hanover, in 1821 was made a knight-commander of the Guelphic Order, and in 1831 was elected a member of the Academy of Sciences at Paris. In celebration of his medical jubilee (1825) traveling scholarships were founded to assist talented young physicians and naturalists. In 1835 he retired. The first work which brought him into notice was the ‹De Generis Humani Varietate Nativa,› and from its publication in 1775 he continued almost for 60 years to exert a powerful influence on the progress of science. Among his numerous published works are the ‹Institutiones Physiologicæ› (1787), long a textbook in many of the most celebrated schools of Europe; the ‹Handbuch der vergleichenden Anatomie› (‹Handbook of Comparative Anatomy,› 1805) and ‹Collectio Craniorum Diversarum Gentium› (1790–1828). The last work gives descriptions and figures of his collection of skulls, one of the most extensive in existence, and is still preserved at Göttingen. Blumenbach held decidedly that the human race formed only one species, and had originally descended from a single pair; but he divided it into the five varieties of Caucasian, Mongolian, Negro, American and Malay. Consult Mark's ‹Memoir› (1840).

BLUMENTHAL, bloo'mĕn-täl, **Oskar,** German dramatist and critic: b. Berlin, 13 March 1852. He founded the Lessing Theatre, Berlin, in 1888, of which he was manager in 1888–97. Here contemporary farce and comedy held the boards. Blumenthal at first tried to elevate the tone of the comedy stage but commercialism forced him to abandon his ideal for the production of hackneyed farces on current events. Sprightliness of dialogue is the most distinguishing character of his plays; the most successful of them are ‹The Big Bell›; ‹A Drop of Poison›; ‹The Black Veil.› He has published several volumes of critical and miscellaneous essays.

BLUMHARDT, Christian Gottlieb, German writer on theological subjects: b. Stuttgart, 29 April 1779; d. 19 Dec. 1838. He became secretary of the Christian (Protestant) Society at Basel in 1803, and was instrumental in founding the Bible Society the following year, and later on, the Maison des Missions (1815), of which he was the general head until his death. Most of his published works consist of sermons, many of them of a controversial nature. Two of these, ‹Lazarus der kranke, sterbende, Auferweckte› (a series), and ‹Versuch einer allgemeinen Missionsgeschichte der Kirche Christi› (5 vols., 1827–37).

BLUNDELL, (Mrs.) **Francis** (M. E. Francis), English novelist: b. Dublin. She is the widow of Francis N. Blundell and has lived for many years in Lancashire, but more recently in Dorsetshire. Her writings, which have steadily increased in popularity, both in England and the United States, include ‹In a North Country Village› (1893); ‹The Song of Dan› (1894); ‹Town Mice in the Country, a Story for Children› (1894); ‹A Daughter of the Soil› (1895); ‹Frieze and Fustian› (1896); ‹Among the Untrodden Ways› (1896); ‹The Duenna of a Genius› (1898); ‹Yeoman Fleetwood› (1899); ‹Pastorals of Dorset,› ‹North, South, and Over the Sea,› ‹The Manor Farm› (1902); ‹Christian Thal› (1903); ‹Dorset Dear› (1905); ‹Simple Annals› (1906); ‹Margery o' the Mill› (1907); ‹Galatea of the Wheatfield› (1909); ‹Our Alty› (1912); ‹Molly's Fortunes› (1914); ‹Dark Rosaleen› (1915).

BLUNDELL'S SCHOOL, a famous English free grammar school in Tiverton, Devonshire, founded in 1604 by Peter Blundell, who left his fortune to charities, the school being the most important of his benevolences. In connection with it five Balliol College scholarships were founded and many persons who afterward became eminent went to Balliol College, Oxford, from Tiverton School. Scholarships were also founded at Sidney Sussex College, Cambridge. The school is mentioned in the novel ‹Lorna Doone› as the scene of John Ridd's early education. In 1880 new buildings in the Tudor style were built for the school in the outskirts of the town. The late archbishop of Canterbury, Frederick Temple, was a student at Blundell's School. Other students who later attained eminence were Bishops Bull, Hayter and Conybeare, Abraham Haywood, the essayist, and R. D. Blackmore, the novelist.

BLUNDERBUSS, a short, heavy, large-bored firearm, often brass-barreled, and bell- or trumpet-mouthed. It was used to discharge a heavy load of slugs or small bullets at a short range, and was once generally employed as a weapon for the defense of houses against burglars. As a military weapon, it was used occasionally on shipboard for repelling boarders, or pouring heavy volleys into boats, when attempting to cut vessels out from anchorage. It is now wholly disused. See Small Arms.

BLUNT, Edmund March, American author: b. Portsmouth, N. H., 20 June 1770; d. Sing Sing, N. Y., 2 Jan. 1862. He is remembered for his publication of the ‹American Coast Pilot› (1796), describing all the coasts of the United States, and containing a vast amount of invaluable information for seamen. More than 30 editions of this work have been published, and it was translated into many foreign languages. He also compiled a number of nautical books and charts.

BLUNT, George William, American hydrographer: b. Newburyport, Mass., 11 March 1802; d. New York, 19 April 1878; a son of Edmund March Blunt (q.v.). He went to sea when 14 years old and served as a sailor till nearly 21; and in 1822–66 was a publisher of charts and nautical books in New York. He made original surveys of many American harbors; was one of the committee that organized the present system of pilotage for New York; made several revisions of the ‹American Coast Pilot›; and was influential in causing the Federal government to adopt the French system of lighthouses and to organize the Lighthouse Board. He was a commissioner of immigration in 1852–54, pilot commissioner in 1855 and became harbor commissioner in 1867.

BLUNT, James G., American soldier: b. Trenton, Me., 1826; d. Washington, D. C., 1881. He was graduated in 1849 at the Starling Medical College, Columbus, Ohio, and settled as a physician in Anderson County, Kan., in 1856; became prominent in the contest over the introduction of slavery into that State, and was a member of the convention that framed its Constitution. Entering the Federal army as lieutenant-colonel of the 3d Kansas Volunteers, he became brigadier-general, 8 April 1862, and was assigned to the command of the military department of Kansas. As such he was engaged in the battle of old Fort Wayne, defeated Marmaduke at Cane Hill, Ark., and, with the aid of General Herron, defeated Hindman at Prairie Grove, and thus checked the Confederate advance into Missouri. He was promoted major-general, 29 Nov. 1862, and in October 1864 gave the final blow to Price's invasion of Missouri.

BLUNT, Stanhope English, American military officer: b. Boston, Mass., 29 Sept. 1850. He was graduated at the United States Military Academy in 1872 and served in the army in the grades from lieutenant to colonel in the ordnance department. He commanded the Rock Island arsenal from 1897 to 1907 and the Springfield (Mass.) armory 1907–12. As lieutenant and captain he served at a number of Western posts and was prominent in target practice instruction in the army. In 1912 he retired from active duty at his own request and is now president of the park commission and president of the Springfield Hospital, Springfield, Mass. He is a contributor to Johnson's 'Encyclopædia' and 'Farrow's Military Encyclopædia.' He wrote 'Rifle and Carbine Firing' (1885); 'Firing Regulations for Small Arms' (1889); and numerous papers on the use of small arms.

BLUNT, Wilfrid Scawen, English poet and traveler: b. Crabbet Park, Sussex, 17 Aug. 1840. He was British attaché at various legations; supported Arabi Pasha in the revolt in Egypt in 1881; and was imprisoned in 1888 for his insurrectionary actions in Ireland. He is author of 'Love Sonnets of Proteus' (1880); 'The Future of Islam' (1882); 'The Wind and the Whirlwind,' (political poems, 1883); 'Ideas About India' (1885); 'In Vinculis' (1889); 'A New Pilgrimage' (1889); 'Esther' (1892); 'Stealing of the Mare' (1892); 'Griselda' (1893); 'Satan Absolved' (1899); 'Seven Golden Odes of Pagan Arabia' (1903); 'Secret History of English Occupation of Egypt' (1907); 'Gordon at Khartoum' (1911); 'The Land War in Ireland' (1912). His complete poetical works were published in 1914.

BLUNTHEAD, a colubrine snake of Java and the East Indies (*Amblycephalus boa*). It is about three feet in length, and purple in ground color, but this is almost entirely concealed by the brown markings and mottlings, and the cheeks and lip-plates are carnation-red. It is perfectly harmless, and is welcomed by the natives to their houses as a vermin-destroyer. It owes its name to the squarish form of the head, which, as in many other species of the family, looks so much like that of a poisonous snake as to deceive most observers. It has a prehensile tail and climbs with ease.

BLUNTSCHLI, blůnt'shle, **Johann Kaspar,** Swiss jurist and statesman: b. Zürich, 7 March 1808; d. Karlsruhe, 21 Oct. 1881. He studied jurisprudence at Zürich, later under Savigny in Berlin, and at Bonn. He became professor in the newly-founded University of Zürich in 1833; took an active part in the political struggles that divided his country, and at first inclined to the party of reform, until the events of 1839 induced him to join the Conservatives, of whom he was, for a time, a leader. He was a councillor of state, and became a member of the government and of the Federal Directory, and afterward worked for the formation of a moderate Liberal Conservative party in Switzerland. In 1848 he went to Munich as professor of civil and international law. There he published his 'Allgemeines Staatsrecht' (5th ed., 1876), on which his reputation as a jurisconsult chiefly rests; 'Deutsches Privatrecht' (3d ed., 1864); and, in conjunction with Arndt and Pözl, 'Kritische Ueberschau der deutschen Gesetzgebung und Rechtswissenschaft' (6 vols., 1853–58). In 1861 he removed to Heidelberg University, and became a privy councillor of Baden, actively forwarding all liberal measures in the state. Liberty in ecclesiastical matters he had equally at heart; he acted several times as president of the Protestantenverein, and it was after delivering a closing speech at the general synod of Baden that he died suddenly at Karlsruhe. He was the author of valuable histories of Zürich and of the Swiss Confederation and of a number of works on law, being especially an authority in international law. He was one of the founders and in 1875–77 was president of the Institute of International Law at Ghent. His library is now possessed by the Johns Hopkins University at Baltimore. Other works by him are 'Das moderne Kriegesrecht' (1866); 'Das moderne Völkerrecht' (1868), and 'Die Lehre vom Staat' (1875).

BLUSHING, a sudden reddening of the face, neck and breast, caused by a rush of blood into the capillary vessels of the skin, resulting from a temporary vasomotor paralysis. A blush is excited by confusion of mind, arising from surprise or diffidence, modesty or shame, or conscious guilt and apprehension, showing the influence of the passions and emotions on the nervous system and the circulation of the blood. Sudden fear and apprehension cause the blood to rush from the external surface to internal organs, leaving the bloodless lips quite pale and the whole face suffused with deathly pallor. It is a kind of inverse blushing; the one being a sudden flash of color in the face, the other a sudden flash of paleness. Consult Darwin, 'Expression of Emotions in Man and Animals' (London 1872); Mitchell, 'About Dreaming and Blushing' (Edinburgh 1905).

BLÜTHGEN, blüt'gĕn, **August Eduard Viktor,** German novelist: b. Zörbig, near Halle, 4 Jan. 1844. He has won high distinction as a writer for the young. Among his stories for boys and girls are 'The Rogues' Looking Glass' (1876); 'The Battle of Frogs and Mice' (1878), and with these is to be classed the letter-press (verses) of O. Pletsch's 'Picture Books.' Of novels and romances he is author of a great many; for example, 'The Peace Breaker' (1883); 'The Step-Sister' (1887); 'Madame the Countess' (1892); 'Die Spiritisten' (1903); 'Des Peterle von Nürnberg' (1907), and 'Mamma kommt' (1911).

BLYDEN, Edward Wilmot, a negro author: b. Saint Thomas, West Indies., 3 Aug. 1832; d. 1912. After vainly seeking, in 1845, admission to some college in the United States, he went to Liberia and was graduated at the Alexander High School, of which he afterward was principal. In 1880 he became president of Liberia College. He held important government positions, and was commissioner of the Presbyterian General Assembly of the United States in 1861 and 1880. He was proficient in many languages, including Latin, Greek, Spanish, Hebrew and Arabic. He published 'Liberia's Offering' (1873); 'From West Africa to Palestine' (1873); 'The Negro in Ancient History,' 'Liberia, Past, Present and Future' (1869); 'Christianity, Islam and the Negro Race' (1887); 'West Africa before Europe' (1905); 'The Three Needs of Liberia' (1908); 'African Life and Customs' (1908); 'The Problems before Liberia' (1909).

BLYTHE, Herbert. See BARRYMORE, MAURICE.

BLYTHEVILLE, Ark., city and county-seat of Mississippi County, 65 miles north of Memphis, on the Arkansas Southern, the Frisco Lines and other railroads. Cotton and corn are grown extensively in the vicinity. The city has a cotton compress and also manufactures hardwood and general lumber. Pop. 6,447.

B'NAI B'RITH, b'nī b'rēth, **Independent Order of,** an association of German Jews formed in the United States in 1843. Its purpose is the moral improvement of the members. Its organization resembles that of the Free Masons, but it is not a secret society, and has no elaborate ceremonial. The organization has since been established in Germany and in the East. In 1918 it had 11 grand lodges, 428 subordinate lodges and 44,893 members. The benefits disbursed during the last fiscal year amounted to $563,422.

BO, or **BODHI TREE,** the pipul or sacred wild fig tree (*ficus religiosa*), under which Buddha is traditionally said to have attained enlightenment and perfect knowledge. A bo-tree is planted near each Buddhist temple, and one is planted on the graves of Singhalese priests at Kandy. An ancient nine story temple marks the site of the original bo-tree under which Buddha sat at Gaya (ancient Uruvela) in Behar. A bo-tree at Anuradhapura, 80 miles north of Kandy, is said to date from 288 B.C. and to have grown from a branch of the mother tree sent from Gaya to Ceylon by King Asoka. It is visited annually by thousands of Buddhist pilgrims who gather its leaves as sacred relics.

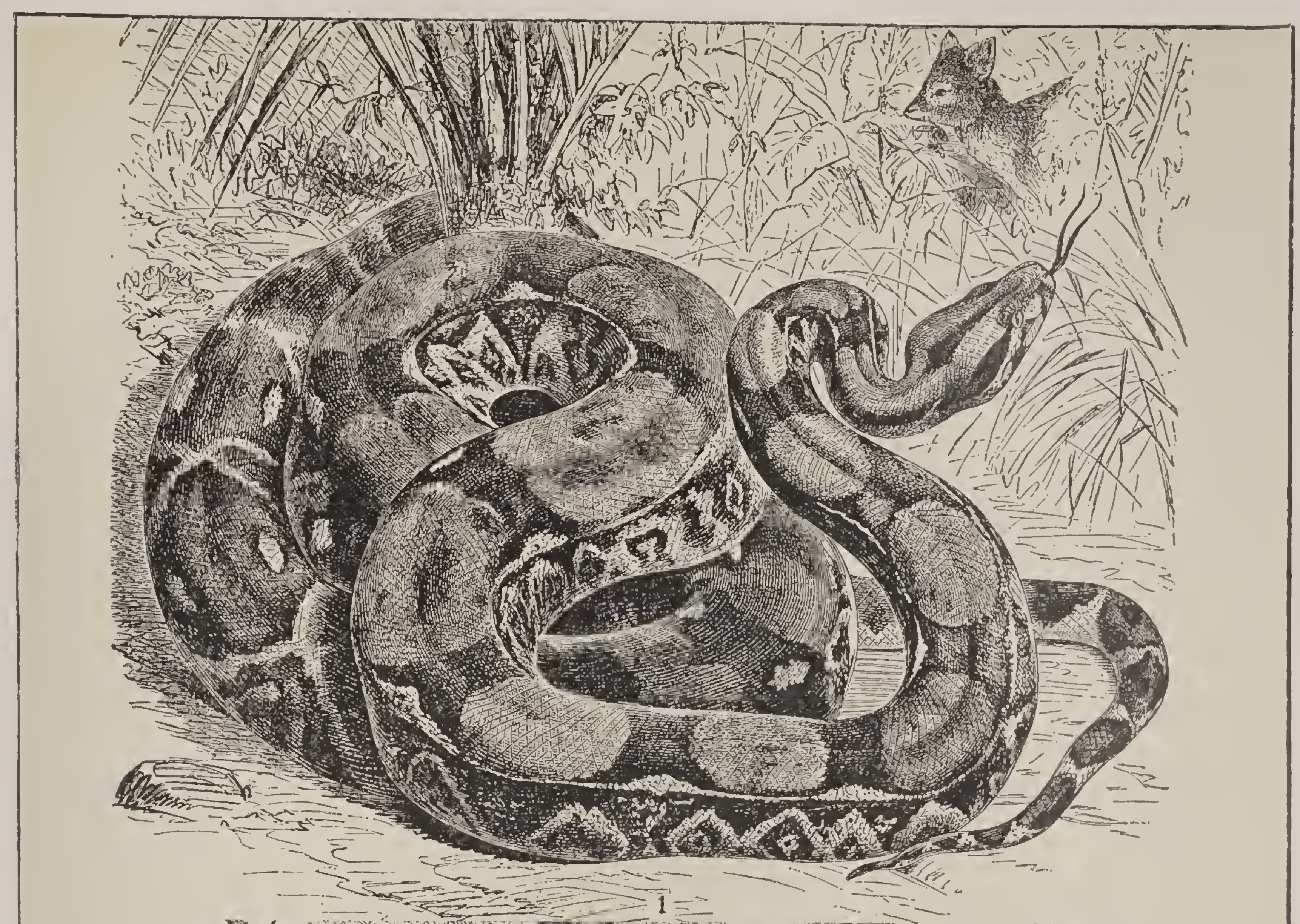
BOA, a serpent of the sub-family *Boinæ* of the family *Boidæ* (q.v.); specifically, *Boa constrictor.*

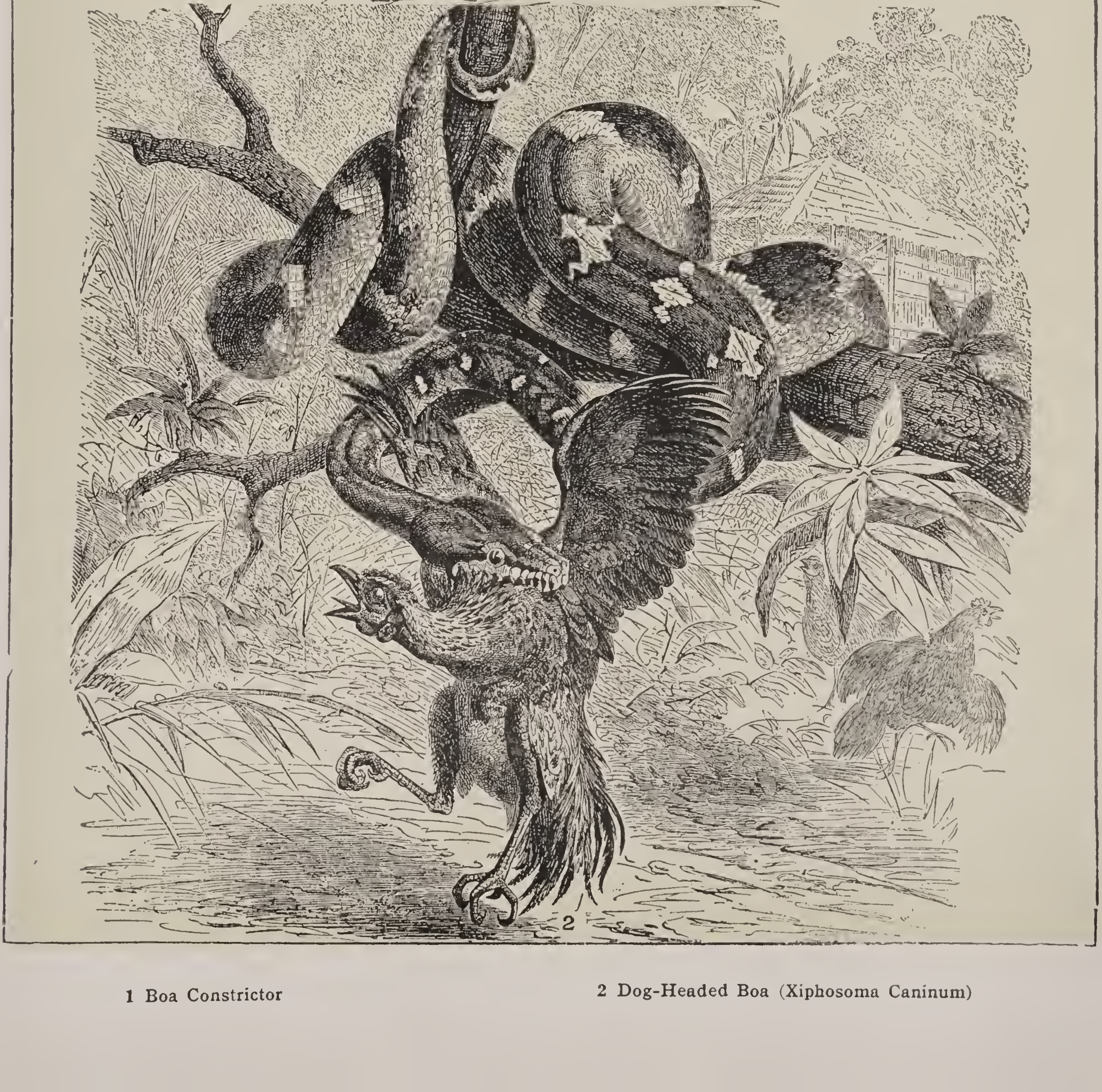
The boas include the largest living snakes, but most of the species are of medium or small size. Their muscular power in the typical forms is very great, enabling them to hang suspended, almost by the tail alone, from trees, and to seize and crush prey to death by swiftly coiling around it. Most of the 40 or 50 species in the sub-family are American, but some small species inhabit the warmer parts of Europe, Africa, Asia and Polynesia. Several of the tropical American boas are huge snakes, the water-boa (*Eunectes murinus*) occasionally exceeding 30 feet in length. (See ANACONDA). They attain sexual maturity, however, long before completing their growth, and the females bring forth their young alive. These young snakes are completely formed, resemble their parents and are able at once to take care of themselves, yet do not for some time wander far from the mother. The American boas inhabit forests and climb to the lower branches of the trees, where they seek or await their prey, usually above a path. There the serpent swings about in the air till some luckless animal approaches; then, suddenly relinquishing his position, he seizes the victim and coils his body instantly round its throat and chest. The folds are then gradually tightened with enormous force and speedily induce death. The animals thus destroyed by the larger boas are sometimes as large as tapirs, deer and even bullocks, but ordinarily much smaller mammals and birds. Having crushed and rolled its prey until its bones are broken and it is compacted into the form of a sausage, the boa takes it into its mouth and slowly engulfs it, the action being facilitated by a copious flow of saliva; but there is no truth in the reputed preparation of the prey by a covering of slime, etc. It is doubtful whether an animal larger than a capybara or goat could be swallowed, even after crushing. The process of digestion is slow, and while it is proceeding the serpent is inert and easily killed or captured. Experience with large examples in captivity show that a full meal once in six months or so seems all they ask or need; and weeks elapse before the indigestible parts pass out.

Several of the larger species are well known and often seen in menageries, where they are easily distinguished by the dog-like shape of the head and by the well-defined patterns of the markings. These are exceedingly handsome in most cases, the colors being yellow buff, chestnut and varying browns, set off by black and white; and the skins, which may be tanned into good leather with the scales on, are of high commercial value for making purses, belts and other ornamental articles. Among the best known species are the common boa — the *Boa constrictor* proper (for that term is ignorantly given to all), which is one of the lesser forms, rarely exceeding 10 feet in length. Its home is the region of the Amazon and Orinoco rivers, and it is pale brown, with a chain-like series of dark-brown markings on each side of the spine, enclosing large oblong-oval spots, and a series of large dark spots along the sides, each with a light centre; on the tail the markings become brick-red. Several other species of this genus, some much larger, inhabit South and Central America. One, the imperial or rainbow boa (*Boa or Epicrates, cenchris*), about seven feet, long, is remarkable in that, although in the shade it appears a pale brown with darker rings, in bright sunshine its skin shines with marvelous iridescence. It is called *aboma* in Mexico, and is believed to be the serpent venerated by the ancient Mexicans and worshipped with bloody sacrifices. Two species of true boas inhabit Madagascar; and three species, all small and of burrowing habits, are to be found on the Pacific coast of the United States. One of these is the stubby little rubber-boa or "two-headed snake" (*Charina bottæ*), well known in California, which has amazing ability as a contortionist.

To a closely related genus (*Eunectes*) belongs the gigantic water-boa whose habits are almost aquatic. (See ANACONDA). Tree-boas (genus *Corallus*) are confined to the forests of tropical America, except one species in Madagascar. They are long, slender serpents of abnormal habits, lightning-like in their quickness in catching birds and naturally savage in disposition; the color is brown except one bright-green Brazilian species. Another genus (*Lichanura*) has a few species that dwell in

BOAS





1 Boa Constrictor

2 Dog-Headed Boa (Xiphosoma Caninum)

the West Indies and Mexico, and are occasionally taken in Arizona and southern California; and small boas of this or an allied sort are frequently brought into our ports from Cuba, tightly coiled about bunches of bananas. The genus *Eryx*, containing small, active, burrowing snakes, belongs to the deserts of northern Africa and Asia Minor.

ERNEST INGERSOLL.

BOABDIL, bō-ạb-dēl', or **ABU-ABDULLAH**, ä'boo-äbd-ool'ạh, last Moorish King of Granada. He gained the throne in 1481 by expelling his father, Mulei Hassan; but being attacked by Ferdinand of Aragon, was defeated and taken prisoner. His father having resumed his crown, Ferdinand set Boabdil at liberty and promised to assist him against his father, on condition of his agreement to become the vassal of Spain. He accepted the ignominious condition and his father died of a broken heart. Boabdil was not permitted to reign in peace. By his tyranny he provoked the hostility of his own subjects, and Ferdinand, taking advantage of the dissensions which prevailed, laid siege to Granada. The Moors made a valiant defense, and were prepared to bury themselves under the ruins of the city, but Boabdil capitulated and retired to a domain of the Alpujarras assigned him by the victor (1491). When on his way he turned round to take a last look of the city and burst into tears. «Right, my son,» exclaimed his mother, Aixa, who was standing by him, «weep like a woman for the throne which you had not the spirit to defend as a man and a king.» The spot is still called «El Ultimo Sospiro del Moro» (the last sigh of the Moor). (See GRANADA). Boabdil soon afterward passed into Africa and fell in battle while assisting the King of Fez in an attempt to dethrone the King of Morocco. Consult Dozy, 'Spanish Islam' (London 1913), and Lane-Poole, 'The Moors in Spain' (New York 1886).

BOADICEA, more correctly, BOUDICCA, Queen of the Iceni, a British tribe, inhabiting what are now the counties of Cambridgeshire, Suffolk, Norfolk and Hertfordshire. She died about 62 A.D. The celebrated earthworks still extant, known as the Devil's Ditch, at Newmarket heath, and at Six-Mile bottom, are supposed to be the fortifications of this tribe, and perhaps of this Queen, against the Romans. She was a contemporary of Nero, and was a woman of remarkable character, both for firmness and ability. Her husband, the King of the Iceni, Prasutagus, dying, left Nero and his own two daughters joint heirs to his great wealth, hoping thereby to preserve his family and kingdom from the rapacity of the conquerors. But immediately on his death his kingdom was taken possession of by the Roman centurions. For some real or imaginary offense, the British Queen was publicly scourged by the executioners, and her daughters were abandoned to the lust of the slaves. Stung to frenzy by this outrage, taking advantage of the absence of Suetonius Paulinus, the Roman governor, from that part of England, Boadicea raised the whole military force of her barbarians, and bursting upon the Roman colony of London, reduced the city to ashes, and put to the sword in that and neighboring places,— of Roman citizens, traders, Italians and other subjects of the empire,— at least 70,000 individuals. Suetonius lost not a moment in hurrying to the scene of action, although it was well known that the Queen of the Iceni was in command of 120,000 men, which gradually increased to 230,000, according to Dion Cassius, while he could bring into the field in all less than 10,000 soldiers. It is true that absolute credit cannot be given to statements of prodigious numbers, such as the above, but at all events the disparity of force was extraordinary. The legion, posted on heights, where its flanks and rear were covered by woods, seems to have received the attack passively, sheltered from the missiles of the Britons by their large, oblong bucklers, until, when the darts and arrows of the barbarians began to fail, by one compact charge they carried all before them. They spared nothing; women, children, the beasts of burden, the dogs, were all cut to pieces. It is said that 80,000 Britons were butchered that day, while of the legionaries only 400 fell, and about as many more were wounded. It is believed that the action took place not far from Saint Albans, Verulamium, a Roman colony, which at the first irruption had shared the fate of London. The Queen, seeing that her cause was lost, committed suicide, rather than submit to the conqueror. The victory was decisive as it established Roman authority in Britain. Beaumont and Fletcher's play, 'Boadicea,' is founded upon the resistance made by Boadicea against Suetonius. Boadicea's story is well known through the poems of Cowper and Tennyson. Consult Tacitus, 'Agricola'; id., 'Annales' (Furneaux's ed., Oxford 1891); Elton, 'Origins of English History' (London 1882); Haverfield, 'The Romanization of Roman Britain' (Oxford 1912); Rhys, 'Celtic Britain' (London 1882).

BOANERGES, bō-ạ-nėr'jēz, an appellation given by Christ to two of his disciples, the brothers James and John, perhaps on account of their fiery zeal. Like «Peter» it was not given at the time of the election of the Twelve, but did not remain in use as did «Peter.» For further explanations of the term consult Burkin, 'Earliest Sources of the Life of Jesus,' and Harris, J. R., 'Boanerges' (1913).

BOAR, Wild, a ferocious, swift-footed species (*Sus scrofa*) of wild swine, made dangerous by its extreme courage and superior strength. It is found in marshy forest-grounds of Europe, Asia Minor and North Africa. The boar is much larger than the domesticated swine; and covered with short, grayish-black, woolly hair, thickly interspersed with stiff bristles, assuming the form of a crest along the spine. The great tusks of the lower jaw are formidable weapons in youth, but later become useless by curving over the snout, when the teeth of the upper jaw which protrude and curve out take their place as weapons. The boar seeks its food at night and feeds on roots, grain and small animals, birds' eggs, etc. Besides this species, several others exist, notable among which are *Sus vittatus* of Asia and Africa, *Sus verrucosus* of Java, and the Celebes and *Sus barbatus* of Borneo. No species of the genus *Sus* are natives of America or Australia. Boars were common in England until the time of Henry II, when they seemed to disappear for the time being, reappearing again in the reign of Charles I, when an attempt was made to raise them in New Forest. It resulted in failure. Formerly the sport of hunting this animal with the aid of great dogs (boarhounds) was the favorite amusement of the nobles of France and Germany, but is now rarely followed except in a few estates in eastern Europe, where the animal is preserved for the purpose. In India, however, the chase of the wild boars of that country, usually called «pig-sticking,» is still foremost among the field-sports of the Anglo-Indians. Consult Harting, ‘British Animals Extinct within Historic Times’ (London 1880), and Johnston, ‘British Mammals’ (ib. 1903).

BOARD, the collective name applied to a number of persons having the management, direction or superintendence of some public or private office or trust; often an office under the control of an executive government, the business of which is conducted by officers specially appointed, as board of admiralty, board of trade, etc.

BOARD OF MEDIATION AND CONCILIATION, United States. A board of commissioners created by act of Congress and approved 15 July 1913. Its purpose is to settle by mediation and conciliation all controversies concerning wages, hours of labor or conditions of employment that may arise between any carriers engaged in transportation in or to the United States and their employees. The commissioner is appointed by the President for a term of seven years. He is the executive officer of the board, which consists of not more than two other officials appointed by the President. In any case where an interruption of traffic is imminent and fraught with serious detriment to the public interest, the board may offer its services to the respective parties. It is also required to bring to bear its best efforts to affect conciliation at the request of either party. If they cannot come to an agreement, the board endeavors to induce arbitration and makes arrangement for such whenever desired. The office is independent of any political party. The Department of Labor (see LABOR, DEPARTMENT OF) has also, through its secretary, the power of profering means of conciliation in labor or industrial disputes in other than traffic arrangements.

BOARDMAN, George Dana, American missionary: b. Livermore, Me., 8 Feb. 1801; d. 11 Feb. 1831. He studied at Waterville College (now Colby University) and at Andover Theological Seminary, and in 1825 was ordained in the Baptist Church. In 1825 he went to India, and in 1827 to Burma, where he labored assiduously in spreading Christianity. The mission planted by him became the central point of all Baptist missions in Burma. His widow married the Rev. Adoniram Judson. Consult King, A., ‘Memoir of George Dana Boardman’ (Boston 1856).

BOARDMAN, George Dana, American clergyman and author: b. Tavoy, British Burma, 18 Aug. 1828: d. Atlantic City, N. J., 28 April 1903; son of the American Baptist missionary of the same name. He was educated in the United States, graduating at Brown University in 1852, and at Newton Theological Institution in 1855. He was pastor at Barnwell, S. C.; afterward at Rochester, N. Y., till 1864, when he became pastor of the First Baptist Church in Philadelphia. In 1899 he established a lectureship at the University of Pennsylvania, known as the «Boardman Foundation in Christian Ethics.» Besides sermons and essays, his chief works are ‘Studies in the Creative Week’ (1878); ‘Studies in the Model Prayer’ (1879); ‘Epiphanies of the Risen Lord’ (1879); ‘Studies in the Mountain Instruction’ (1880); ‘The Kingdom’ (1899); ‘The Church’ (1901); ‘The Golden Rule’ (1901).

BOARDMAN, Richard, English missionary: b. 1738; d. Cork, Ireland, 4 Oct. 1782. He became a member of Wesley's conference in 1763, and volunteered for service in America in 1769. He preached in New York and through the Middle States till 1774, and then, returning to England, continued his itinerant ministry. He is known as one of the founders of Methodism in the United States.

BOARDS OF ELECTION. See CONGRESS; ELECTIONS; ELECTORAL QUALIFICATIONS.

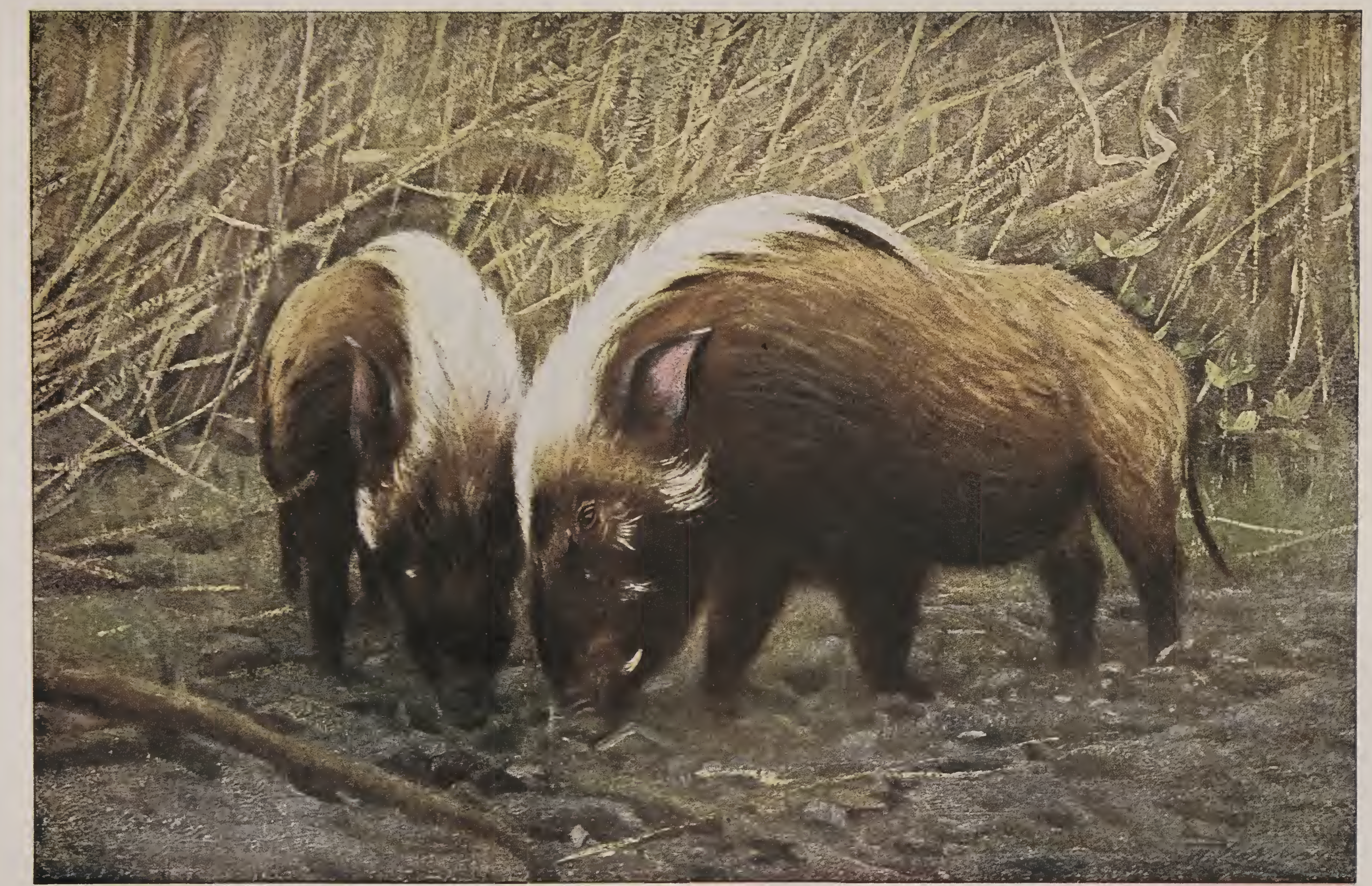
BOARFISH, a fish (*Capros aper*) of the family *Caproidæ*, found off the southern coast of Europe. The body is small, oval, compressed and carmine in color, with seven transverse orange bands on the back, and has a long, hog-like snout. The flesh is held in small repute.

BOARHOUND. See HOUND.

BOAR'S HEAD, The, a tavern in Eastcheap, London, destroyed in the great fire of 1666; it was rebuilt but was demolished to make way for an approach to London Bridge; its site is now occupied by a statue of William IV. The inn figures in Shakespeare's ‘Henry IV’ and ‘Henry V’ as the resort of Falstaff and his boon companions.

BOAS, bō'as, **Franz,** German-American ethnologist: b. Minden, Westphalia, 9 July 1858. He studied at Heidelberg, Bonn and Kiel universities, 1877–82; traveled in the Arctic regions, 1883–84; was assistant in the Royal Ethnographical Museum in Berlin, and privatdocent in geography at the university in 1885–86, when he became instructor in anthropology in Clark University. In 1886–88 he was a member of the editorial staff of *Science*. In 1899 he became professor of anthropology at Columbia University. In 1901 he became curator of the American Museum of Natural History. In 1907–08 he served as president of the American Anthropological Society and in 1910 of the New York Academy of Science. He has spent much time among various American Indian tribes; took part in the Jesup North Pacific Expedition, the ‘Reports’ of which are edited by him. His published works include ‘Baffin Land’ (1885); ‘The Central Eskimo’ (1888); ‘Indians of British Columbia’ (1888–92); ‘The Growth of Children’ (1896); ‘Changes in Form of Body of Descendants of Immigrants’ (1911); ‘Mind of Primitive Man’ (1911); ‘Kultur und Rasse’ (1913).

BOAT, a term now indiscriminately used for sea and river vessels of all kinds, but more properly applied to a vessel that can be hauled up on or launched from a beach. It may be propeled by oars, sails, steam or other motive power. From the earliest ages men have used buoyant contrivances to float them across streams and lakes. The primitive log or num-



WILD BOARS (*Sus porcus*)

ber of logs lashed together to form a raft, or bundles of brushwood or reeds used for the same purpose, early developed into the parent of modern boats, the dug-out, which has been found in association with Stone Age remains and in Swiss lake dwellings. Bark canoes and wickerwork frames covered with skins, such as the coracle of the ancient Celts, marks a further stage of development. There are differences in the ways of laying on the planks in the modern small boat, viz., the planks may be laid edge to edge so as to present a smooth exterior; the boat is then said to be carvel-built; the planks may overlap, and the boat is described as clinker-built. Naturally the various types of boats are countless in number, for they vary in every part of the world and in the same port for every different class of work and the character of the waters on which they are to sail. Some are needed swift, some roomy, some for pleasure, some for rough weather; the enumeration is endless. They are usually classed for racing purposes as open, half-decked and decked boats. The canoe, punt, skiff, gondola, dingy and outrigger are used on smooth water for pleasure and racing. The boats used by watermen vary greatly, according to the locality. Whaleboats are sharp at both ends, and may be steered with an oar or ordinary rudder. Lifeboats are provided with air chambers which render them self-righting or self-bailing, or both combined. The following boats are used in the United States navy for rowing and sailing: barge, cutter, whaleboat, gig and dingy. Steamer and motor-boats are also used. The cutter type includes the dingies and launches and are square-sterned. Steamers resemble cutters in build, but are much heavier, are partly decked and some types have rounded or pointed sterns; motor-boats are of various types. Gigs are of cutter build, but are longer, narrower and of less depth than the cutters. They are now little used. Dingies have four oars; cutters and whaleboats from 6 to 14; gigs about 6; and launches 12 to 16. Masts and sails are supplied to be used when occasion requires or offers. Internal combustion engines are fast coming into general use for the propulsion of all types and sizes of boats. Boats are single- or double-banked, as they have one or two oars to a thwart. The seats for the crew of a boat are called thwarts, the strip on which they rest is called the rising, the space abaft the after thwart the stern sheets, that forward of the first thwart the fore sheets, the spaces for the oars the rowlocks and the rim or upper edge of the boat the gunwale. Race boats differ much in shape from other boats; having only speed in view, they are built as light, narrow and sharp as possible. They are rowed with from two to 12 oars, and are from 15 to 70 feet in length, and generally not more than eight inches above water. The two-oared boats are called shells, sculls or wherries; the larger ones sometimes barges. In modern war vessels the boats are rested amidships on chocks or skid frames, but on merchant and passenger steamships boats are carried at the davits. These are usually curved bars, the lower ends of which rest in a socket, with a collar around them higher up near the ship's rail. The upper blocks of the boat-falls are secured to the curved arm of the davit and the lower blocks are fitted to rings in the boat. Mechanical davits are now coming into use on the larger ocean steamships. Every sea-going ship is by law required to carry a specified number of boats, according to the tonnage. Sea-going ships carrying passengers must carry lifeboats and have sufficient boat accommodation for all the passengers carried. Owing to the impossibility of stowing away these on a large ship collapsible boats of various types are in use, also rafts with a large number of buoys. See LIFEBOAT; ROWING; SHIP; YACHT.

BOAT CANALS. See CANALS.

BOAT-FLY (*Notonecta glauca*), an aqua-hemipterous insect which swims on its back; the hind-legs aptly enough resembling oars, the body representing a boat; hence the name. It frequents stagnant waters, swimming rapidly on the surface, but diving below whenever the water is disturbed. In color it is gray and black, with greenish elytra and white wings. The small insects which constitute its food are devoured in very large numbers. The female usually deposits the eggs on the stems and leaves of aquatic plants. See WATER BUG.

BOATBILL, a South American heron (*Cancroma cochlearia*), having a remarkable bill, suggesting in its broad, inflated shape an upturned boat, the keel of which is represented by the ridge of the culmen. The bird is about the size of a domestic fowl, but with shorter legs than most of the herons. Its general color is reddish-gray, with black and white markings. The back of the head and neck are covered with elongated, erectile feathers. A naked gular pouch hangs beneath the lower jaw. Its habitat is in Brazil and Guiana. It feeds upon worms, crabs and other small aquatic animals caught in muddy shallows. Another species (*Cancroma zelendoni*) inhabits Central America. See HERON.

BOATSWAIN BIRD, or **MARLINSPIKE,** either of two species of a sea-wandering bird, so called because of the long, pointed feathers in its tail, which resemble a marlinspike, the boatswain's badge of office. One is the skua-gull (*Stercorarius parasiticus*), and the other a tropic-bird (q.v.).

BOAZ, a wealthy Bethlehemite, who took upon himself the duty of providing for Ruth, as the near relation of her dead husband, Elimelech. From him Jesus Christ was directly descended.

BOB-WHITE. See QUAIL.

BOBAC, a European and central Asiatic gregarious marmot (*Arctomys bobac*), resembling the American woodchuck in habits and appearance, but smaller.

BOBADILLA, bō-bä-dēl'yä, **Francisco de,** Spanish soldier: d. 29 June 1502. He was commander of the Order of Calatrava and in the year 1500 he was selected as a commissioner to enquire into the condition of the new Spanish colony of Hispaniola, and especially into the complaints which had been made against the administration of Columbus (q.v.). He was entrusted with unlimited powers, which he immediately exercised by arresting Columbus, putting him in chains and sending him to Spain. He next abolished the regulations which had been enacted by Columbus, and indulged the colonists in all the excesses of power, and, above all, in boundless oppression of the natives. The unexpected outrage upon the most noted man of the time excited general indignation in Spain, and was regarded as a national dishonor. Orders were accordingly sent for the recall of Bobadilla, and when Columbus, now reinstated in his honors and emoluments, made his fourth landing in Hispaniola on 29 June 1502 the fleet bearing Bobadilla and other enemies of Columbus started for Spain. A fearful tropical hurricane wrecked the ships, and Bobadilla perished.

BOBBIN, a reel or other similar contrivance for holding thread or yarn. It is often a cylindrical piece of wood with a flange, on which thread is wound for making lace; or a spool with a flange at one or both ends, intended to have thread or yarn wound on it, and used in spinning machinery (when it is slipped on a spindle and revolves therewith) and in sewing-machines (applied within the shuttle). Bobbins are usually manufactured by means of automatic machinery.

BOBBINET, a lace, with a hexagonal eyelet, manufactured by machinery, in imitation of the lace made on a pillow. See LACE.

BOBBIO, Italy, small town in the province of Pavia, 37 miles northeast of Genoa, the seat of a bishop, with an old cathedral, and formerly a celebrated abbey founded by Saint Columbanus in 612, in the library of which was a famous collection of manuscripts, made known to moderns by Niebuhr and others, now divided between the Vatican and the Ambrosian Library at Milan. The population of the commune is about 5,000.

BOBOLI (bō′bō-lē) **GARDENS**, the grounds of the Pitti Palace at Florence, planned in 1550 under the patronage of Eleanora of Toledo and the direction of the sculptor Tribolo. They contain many fine statues and the Isoletto fountain, designed by Jean de Bologne.

BOBOLINA, bō-bō-lē′nä, Greek heroine: d. 1825. Her husband was put to death at Constantinople in 1812 by order of the Sultan, and Bobolina vowed revenge. At the beginning of 1821 she fanned the flames of insurrection among the Greek population in Turkey, equipped at her own expense three ships, herself taking command of one bearing her flag, as admiral, and giving the others to competent captains, while her two sons fought against the Turks on land. In September 1821 she attended the siege of Tripolitza, to meet the Peloponnesian leaders there assembled. She put her ships at the disposal of the government and maintained the blockade of Nauplia for 14 months, until the Turks were forced to capitulate. She then proceeded, with a small Greek fleet, which was entrusted to her charge, to the coasts of Morea, and during the siege of Monemvasia, when one of her nephews lost his life, she did not even waste one hour upon him, but quietly drawing a cloak over his body, avenged his death by continuing to bombard the city. After the war she lived with her brothers at Spezzia. In 1825 her house was attacked by the friends of a young lady who was supposed to have been dishonored by some member of her family, and she was killed by a rifle shot fired by one of the assailants.

BOBOLINK, an oriole of the family *Icteridæ*, found in plains, prairie-lands, meadows and cultivated fields throughout the entire United States, except on the Pacific coast. The male is 7.7 inches long, its tail taking up fully half of its length. It is distinguished from the blackbirds and other orioles by its pointed tail-feathers, long middle toe and variegated plumage. The male has two distinct sets of plumage, a summer or breeding dress, and a winter one. The former dress is lustrous black, with the neck, scapulars, rump and upper tail coverts buff, inclining to ochraceous on the neck, and ashy on the tail; the latter is similar to that of the female, who is protectively clothed in much-streaked yellowish-brown neutral tints; the young of both sexes also resemble her, until the young males reach maturity. The gay summer dress of the male, especially the black part, is due to the black margins upon the feathers that come in with the spring renewal of plumage. These edges wear away, and thus, as the season advances, the brownish centres of the feathers are gradually revealed. The song of the male is a varying melody, an incessant outpour of ecstatic music, in which one detects distinctly enunciated the word «bob-o-link.» Its excited manners are as peculiar as its song, which often bubbles out of its beak as it flutters and dances in mid-air. As the summer advances and the plumage changes, the song diminishes, and finally ceases altogether.

Their nests consist of grasses neatly and skilfully entwined, and ingeniously hidden among the stems and leaves of plants, and are guarded carefully and most jealously by the male, whose exuberant pride in the four or five dull-white, flecked and marbled eggs is remarkable. The bobolink goes in summer as far north as the banks of the Saskatchewan, but is most plentiful in the Northeastern States, where it renders good service by the destruction of insects and their larvæ. It begins to migrate southward in August, and assembles in huge flocks in early autumn in the great wild-rice marshes that border Delaware and Chesapeake bays and their rivers, where they fatten on the wild rice, and are shot in vast numbers for market, under the name of «reedbird.» Later in the season these birds advance southward and assail the cultivated rice plantations, where they are known as rice-birds and would ruin the crops, partly by eating, but mainly by breaking the stalks and shaking out the grain, were they not constantly killed or scared away by thousands, by men and boys who are employed to shoot them. On their return from the tropics in the spring they also attack the young plants. In consequence of this necessary persecution in the rice fields the species has been seriously diminished of late years, and bobolinks are becoming rare in many parts of the United States and Ontario. On account also of their beauty and powers of song, many are caught, caged and sold in the bird-stores.

BOBORYKIN, bŏ-bō-rĭ′kin, **Piotr Dmitrievich**, Russian man of letters (novelist, playwright, scientist, actor, etc.): b. Nizhni Novgorod, 15 Aug. 1836. After having received in his grandfather's home a most careful preliminary education under competent instructors, he attended the courses in chemistry, medicine and law at the University of Kazan. After having compiled and translated several books on chemistry and physiology he left Kazan and came to Saint Petersburg (1861) with the intention of dedicating his efforts to *belles-lettres*. While still a student he wrote three dramas: ‘Fantazer,’ ‘Rabyonok’ (‘Child’), ‘Odnodoretz’ (‘Freeholder’); the last of which was published in the *Biblioteka dlya chteniya* (i.e., «The Library for Reading»). But Boborykin tried many other fields, and when, after having inherited from his grandfather a vast fortune, he bought and edited the *Biblioteka dlya chteniya,* published a great number of novels, short stories, etc., so that his collected works form a library of some 80 volumes compactly printed on 400 pages each. It was in this periodical that appeared his novels ‘Put-Dorogu’ (‘On the Way’) and ‘Zemskiya Sily’ (‘Earthly Powers’). When the magazine ceased to exist (in 1865) Boborykin went abroad and spent about 10 years in Vienna, Paris, London and Italy, from where he sent to the periodicals at home a great number of critical studies, theatrical reviews, etc. His love for dramatic art prompted him to publish (1872) his ‘Teatralnoe Iskustvo’ (‘Theatrical Art’), which earned him a great fame. But his principal field was the contemporary novel. Endowed with unusual leisure and enriched with an enormous encyclopædic knowledge, he wrote more than 30 novels, amongst which the following were popular with his contemporaries: ‘Zhertva Vechernaya’ (‘Evening Sacrifice’), ‘Solidnyia Dobrodyeteli’ (‘Solid Benefactors’), ‘Doctor Tzibulka’, ‘Iz Novikh’ (‘From Amongst the New’), etc. All his novels excel in keen observation and have a fluid style. He has often drawn the portraits of his friends and acquaintances in Petrograd, Moscow, Novgorod and foreign towns with such an accuracy that one could easily recognize them if one had ever met them. But it would be exacting too much from a writer like Boborykin if one expected to find in his numerous works any depth of perception such as one encounters in Tolstoy or Dostoyevski. He is a photographer of characters rather than a master painter.

BOBRUISK, bō-brōō'ęsk, Russia, a fortified town in the government of Minsk, on the right bank of the navigable Beresina, at its junction with the Bobruisk, 108 miles southeast of Minsk, with which it is connected by rail. By steam navigation it is connected with stations on the Dnieper and the Beresina. It has a departmental college and a military hospital. It has manufactures of iron and flour, and its commerce consists in exports of timber and grain. The place was fortified by Alexander I, and in 1812 was unsuccessfully besieged by the French, and the defenses were extended by Nicholas I, who raised it to the position of a fortress of the first rank. In 1902 an extensive conflagration nearly destroyed the town.

BOBS, a nickname given by English soldiers to the late Field-Marshal Earl Roberts (q.v.).

BOCAUE, bo-kow-ą, Philippines, a town in the province of Bulacan, Luzon, situated a few miles east of Manila Bay, near the city of Bulacan, and near the railroad line. Pop. 8,438.

BOCCACCINO, bŏk-kä-chē'nō. **Boccaccio,** Italian painter: b. Cremona 1460; d. 1518. Few details of his life are known. He came under the influence of Mantegna and in his school in Cremona numbered Benvenuto Garofalo among his pupils. In 1497 he painted a series of frescoes in Saint Agostino in his native city, but he is better known by his frieze in the cathedral. This represents the birth of the Virgin and various incidents in her life. Among his paintings are ‘Marriage of Saint Catharine,’ in the Venice Academy; ‘Virgin and Two Saints,’ in San Quirilo, Cremona, and a ‘Holy Family,’ in the Louvre, Paris. Several works formerly attributed to Perugino, Pinturicchio and Garofalo are now ascribed to Boccaccino. He committed suicide.

BOCCACCIO, bōk-käch'ō, **Giovanni,** Italian novelist: b. 1313, in Paris or Florence; d. Certaldo, 21 Dec. 1375. His family was originally of Certaldo, but his father being engaged in commerce, removed to Florence, where he amassed wealth and filled several important public offices. Very early in life Giovanni displayed a remarkable aptitude for learning, and before he was seven years old composed verses with perfect facility. He was placed under the care of an eminent master, Giovanni da Strada, but his father having determined on a commercial career for his son removed him from his tutor before his Latin course was completed, and as soon as he had acquired a sufficient knowledge of arithmetic apprenticed him to a merchant, with whom he remained six years. His master finding that he profited nothing, although he made in his company several commercial journeys, finally in despair sent him back to his father, and was accustomed to regard him as a very narrow-minded youth. His father discovering that his son would never make a merchant, thought that his studious habits might serve him in the legal profession. But the law proved as distasteful as commerce, and the father, finding that the law had little attraction for Giovanni, forced him to return to commerce, and fix his residence in Naples. The King, Robert of Anjou, a friend and patron of Petrarch, was greatly devoted to literature and thus drew to his court the most eminent scholars of Italy. Boccaccio was well acquainted with Giovanni Barrili, a man of erudition, and Paolo of Perugia, the King's librarian, and excited by their example and encouragement, he entirely abandoned commerce and gave himself up to the pursuit of learning. His father gave his consent only on the condition that he should study the canon law, and although against his disposition, he applied himself to it for some time, took his doctor's degree and after that found himself more at liberty to indulge his passion for poetry, while at the same time he devoted himself to the higher branches of philosophy, astrology, then a favorite study, and to the fathers of the Church. He remained eight years in Naples and during his stay there was filled with desire of distinction by the visit of Petrarch on his way to Rome, where he had been decreed the honor of the laurel crown. Boccaccio marked with delight the splendid reception given to Petrarch, his examination of three days, his noble oration and the applause which followed, but was far more pleased in after years to make the acquaintance of the illustrious poet, with whom he formed a life friendship. Boccaccio was naturally fond of gay company and fell in love with the Princess Mary, illegitimate daughter of King Robert, and half-sister of the celebrated Joanna of Naples. She was married to a Neapolitan gentleman, but at once ardently returned Boccaccio's love and became his avowed mistress. At her instance, he composed his romance of ‹Il Filocopo› and ‹L'Amorosa Fiammetta,› in the latter of which his lady, under the name of Fiammetta, bewails the loss of Pamphilo, supposed to represent himself. The ‹Filocopo› is not skilfully constructed and is filled with spectres and visions of every kind and the powers of darkness are summoned before the reader to account for its scenes and incidents. Yet it contains passages of that wondrous grace and vivacity afterward so signally displayed in the ‹Decameron,› and touches of human nature in which the whole character is pictured in a single sentence. While thus employed at Naples he was suddenly summoned to Florence by the illness of his father. His separation from the Princess Mary appears to have affected both lovers with violent sorrow, and it was only by the composition of the romance of ‹Ameto› that he could console himself during his absence. His father's recovery and marriage set him again at liberty to return to the favors of his adored princess. He was not only happy from his connection with the Princess Mary, but possessed the favor of Acciajuoli, who had great power in Naples, and even the regard of Queen Joanna herself. It is asserted on respectable authority that many of the most licentious passages in the ‹Decameron› were written in conformity with the taste and by the command of the Queen. His father died in 1350, leaving a son by his wife, Bice dei Bosticchi, who was also dead, to the care of Boccaccio. The poet faithfully attended to his trust, and becoming acquainted with Petrarch, the latter's example and influence began very shortly to act upon the mind of his younger friend, who from the date of their friendship commenced to turn his thoughts more from licentious pleasures to purer fame. Being now permanently settled in Florence, Boccaccio, by Petrarch's advice, began to take some interest in the affairs of state. His motives were appreciated, however, and he was sent on an embassy to Padua, to invite Petrarch to accept the presidency of the university. Several other missions followed and in April 1353 he took part in one to Pope Innocent VI, the papal court then residing at Avignon. In the same year was published his ‹Decameron› or ‹10 Days' Entertainment,› one of the most extraordinary works of genius ever written, and which after the lapse of five centuries is still regarded as one of the purest specimens of Italian prose, as an inexhaustible repository of wit, beauty and eloquence, although unhappily marred with licentious descriptions. While occupied with these popular compositions, Boccaccio did not lose sight of higher pursuits in literature. Like Petrarch he was a devoted collector of ancient manuscripts and a diligent student of the classics. On one occasion Boccaccio visited Monte Cassino, within whose monastery he knew many works had been collected, which had escaped the ravages of the barbarians, but found, to his amazement, that they were suffered to rot in a damp loft exposed to the weather, and that frequently when the monks were in want of money, they took some of the manuscripts, obliterated the writing, replaced it by copying on the parchment some part of the ritual, and then sold the new productions among the people of the neighborhood. To such collectors as Petrarch and Boccaccio, and to the latter pre-eminently, the world owes a debt of gratitude for the rescue of many of the great classic works which otherwise would have been irretrievably lost. In 1359 the author of the ‹Decameron› visited Petrarch at Milan, conversed with him, as he informs us, at great length on the subjects of morality and religion, and determined to devote himself more seriously to holy studies. This resolve received additional stimulus in 1362 from a singular circumstance. A monk from the Carthusian monastery at Siena came to visit him, saying that he was charged with a message to him from Father Petroni, who on his deathbed, although he had never seen Boccaccio, declared that he knew him in spirit, and commissioned the monk to exhort him to repentance. In order to prove the truth of his words, the monk told Boccaccio of a circumstance in his life which the poet thought known only to himself. So great was the effect of this warning, that he determined to abandon poetry, sell his library and lead a life of penance and meditation. With this view he wrote to Petrarch, supposing that his sudden purpose would meet with kindred enthusiasm, but his friend answered in a strong, common-sense letter, instructing him to receive the warning to repentance, but informing him that there was no necessitv for selling his books or abandoning his studies. Boccaccio accordingly wrote in a strain altogether free from his former one, while he assumed the ecclesiastical habit and applied himself to theology. With disinterested generosity a large part of his means was dissipated in the collection of Greek manuscripts, his emissaries visiting many parts of Europe to procure them. His fortune was thus gradually impaired, and toward the decline of life he found himself poor and deserted by all his friends, except the noble-minded and constant Petrarch. That great poet wished his friend to take up his abode with him, but Boccaccio preferred independence, and declined the offer, although he visited Petrarch whenever he found an opportunity. In 1363 he was invited to Naples by the grand seneschal Acciajuoli, but was so hurt by his cold reception that he soon left and went to Venice to meet Petrarch. On returning to Florence he found its turbulent state of society in little accordance with his wish of retirement, and took up his abode in a little cottage in Certaldo, in the vale of Elsa, dear to him as the birthplace of his family. From this retreat he was soon summoned by the chief citizens of Florence to undertake an embassy to Urban V at Avignon, and repairing to the papal court he experienced the most flattering reception. He was again sent to Urban in 1367, after the pontiff had removed to Rome, when the character of Boccaccio had so changed from his former looseness that he was characterized by the bishop of Florence as one in whose purity of faith he had the utmost confidence. He was now honored by the Florentine magistrates with a professorship founded in memory of Dante, for the better explication of the ‹Divina Commedia.› His lectures commenced in October 1373 and continued until his death, which was doubtless hastened by the demise of Petrarch 10 months before his own. In eloquent language he bewailed his loss. Boccaccio wrote numerous works in Italian and Latin, and both in prose and poetry, few of which are referred to at the present day; his great fame rests upon the ‹Decameron.› In these hundred tales of love, displaying the most wonderful fertility of invention, the reader is perpetually delighted with the beauty of the narrative and the variety of the scenes, whether of intrigue, wit or pathos — no two stories, nor even their introductions, resembling each other. The author's fondness for involving friars in every imaginable scene of mischief and ludicrous mishap created great scandal to the Church, and his famous romance, the 10th novel of the sixth day, in which «Friar Onion promises some country people to show them a feather from the wing of the angel Gabriel, instead of which he finds only some coals, which he tells them are the same that roasted Saint Lawrence,» drew down the solemn anathema of the Council of Trent. The editions of the ‹Decameron› are almost innumerable and translations exist in all the languages of Europe. The earliest editions are extremely rare and of that of Valdarfer in 1471, only one copy is known. Boccaccio's poem, ‹Il Teseide› is written in the *ottava rima,* of which he is usually considered as the inventor, and is the first Italian poem which presents a specimen of the epopee. Chaucer borrowed from this poem his ‹Knight's Tale,› and Shakespeare a part of his ‹Midsummer Night's Dream.› The great English dramatist has also, in some measure, availed himself of Boccaccio's ‹Decameron,› as in ‹Cymbeline› and ‹All's Well that Ends Well.› With all his faults, we may consider Boccaccio one of the great revivers of learning and a benefactor to mankind, as well as worthy of the third place in that great triumvirate with Dante and Petrarch, «which renders the 14th century so splendid an epoch in the history of literature.» (See DECAMERON). Consult Cochin, ‹Boccaccio, études italiennes› (1890); Hutton, E., ‹Giovanni Boccaccio: A Biographical Study› (New York 1910); Symonds, ‹Giovanni Boccaccio as Man and Author› (1895); consult also complete edition of Boccaccio's works by Moutier (Florence 1827–34); and the ‹Decameron,› expurgated edition by Fornaciari (Florence 1900).

BOCCAGE, bŏk-käzh, **Marie Anne Fiquet du** (LE PAGE), French poetess: b. Rouen, 22 Nov. 1710; d. there, 8 Aug. 1802. She was educated in Paris, in a nunnery, where she manifested a love of poetry. Her first published work, a poem on the mutual influence of the fine arts and sciences, appeared in 1746 and gained the prize from the Academy of Rouen. She next attempted an imitation of ‹Paradise Lost,› in six cantos; then of the ‹Death of Abel›; next, a tragedy, ‹The Amazons›; and a poem in 10 cantos, called ‹The Columbiad.› Madame du Boccage was praised by her contemporaries with an extravagance for which only her sex and the charms of her person can account. *Forma Venus, arte Minerva,* was the motto of her admirers, among whom were Voltaire, Fontenelle and Clairaut. There is a great deal of entertaining matter in the letters which she wrote on her travels in England and Holland. She was a member of the academies of Rome, Bologna, Padua, Lyons and Rouen. Many of her works have been translated into English, Spanish, German and Italian.

BOCCANERA, bŏk-kä-nā'rä, **Simone,** first Doge of Genoa; d. 1363. He was born of an illustrious noble family, but early took part with the democratic party and gained great popularity by undertaking the defense of the people against the nobles. During a commotion caused by the severity with which Philip of Valois had punished a mutiny on board some Genoese galleys in the service of France, the people wished to appoint Boccanera their abbé, an office which appears to have been similar to that of the tribunes at Rome. Boccanera declined to accept, on the ground that his noble birth would not allow him to become a plebeian magistrate. The excuse only made the people more determined to place him at their head and as he would not be abbé they by acclamation hailed him doge. During his administration he successfully combated the various factions and secured a Genoese triumph over the Moors of Spain, the Tartars and the Turks. The office, thus introduced into Genoa for the first time in 1339, was exercised by Boccanera till 1344, when the ascendency of a faction opposed to him obliged him to abdicate and retire to Pisa. He afterward regained the office in 1356, and had held it for seven years, when his enemies succeeded in destroying him by poison.

BOCCHERINI, bŏk-kā-rē'nē, **Luigi,** Italian composer of instrumental music: b. Lucca, 14 Jan. 1740; d. Madrid, 28 May 1805. He received his first instruction in music and on the violoncello from his father and the Abbé Vanucci, music-master of the archbishop. He further improved himself in the art at Rome, and afterward went, with Filippo Manfredi, his friend and countryman, to Spain, where he met with but indifferent patronage and latterly suffered greatly from indigence. Previous to 1797 the King of Prussia, Frederick William II, who was a great lover of the violoncello and admired Boccherini's compositions, had paid him a pension on condition of his sending him yearly some of his quartets and quintets. The compositions which Boccherini published himself consist of symphonies, sextets, quintets, quartets, trios, duets and sonatas for the violin, violoncello and pianoforte. He never composed anything for the theatre; and of church compositions we find but one, his ‹Stabat Mater.› The adagios of Boccherini excited the admiration of the connoisseurs and the despair of the composers of his time. He may be regarded as a sort of minor Haydn, and he was the first who wrote instrumental quartets, of which all the parts are *obbligato,* and determined the true character of this species of music. His melodies are more highly esteemed in England, France and Spain than in Germany. Consult Cerù, D. M., ‹Cenni intorno alla vita e le opere de Luigi Boccherini› (Lucca 1864); Picquot, L., ‹Boccherini› (Paris 1851); Schletterer, H. M., ‹Boccherini› (Leipzig 1882).

BOCCONIA, or **PLUME POPPY**, a genus of four or five species of plants of the family *Papaveraceæ*. *B. cordata*, a native of Japan and China, is the only species of special merit. It is a hardy perennial herb with large leaves similar to those of bloodroot, and small, usually pinkish apetalous flowers borne in large terminal panicles rising like spires from four to eight feet above the dense foliage. Where known, it is a favorite in borders and shrubberies and is also largely used upon lawns for its remarkable appearance. It is very much sought by bees, and should prove a valuable bee-forage, since it will thrive almost anywhere. It is readily propagated by seeds, divisions of the root and by suckers. If set in rich soil the plants will attain the greatest size and attractiveness.

BOCHART, bō-shär, **Samuel**, French divine: b. Rouen 1599; d. Caen, 16 May 1667. He studied philosophy and theology at Sedan, visited England and Leyden, and, returning to France about 1628, became Protestant minister of Caen, a post which he held till his death. He achieved fame as a controversialist in his dispute with the Jesuit Véron, from which the latter withdrew after an 11 days' contest, and an account of which he published. His next work, ‹Geographia Sacra› added so much to his reputation that Christina, Queen of Sweden, invited him to Sweden, in which journey he had for his traveling companion the celebrated Huetius, afterward bishop of Avranches. Bochart's next great work is entitled ‹Hierozoicon, or an Account of the Animals mentioned in Scripture.› It was scarcely completed when its distinguished author, while addressing the academicians of Caen, was struck with apoplexy and died almost instantaneously. Besides the work above mentioned, he wrote several others, among which is a ‹Letter to Dr. Morley,› written, it is said, at the request of King Charles II, in which he discusses the theological controversies of the day. His principal works are still standards on the subjects of which they treat.

BOCHE, a name employed with the signification *German*, especially *German soldier*, by the Allies in France in 1914–17, and given currency everywhere through the widely published descriptions of the campaigns of the European War. It came to express war-engendered hatred of the Teutons, but is nevertheless not a war-creation. On the contrary, for many years before the war it had been (first in the form *Alboche*) a familiar part of the Parisian popular vocabulary. *Alboche* may be called a «telescope word,» like *autobus* (*auto*-mobile and omni-*bus* joined in a single word of convenient brevity). By analogous telescoping the Parisians made *Alboche* out of *Allemand*, the French word for German, and *caboche*, slang or cant for «head» (Low Latin *boscia*). It was speedily shortened to boche or Boche, and is a striking example of onomatopœia, the very sound of the word expressing French estimates of the invaders' character and giving to that one syllable vitality that is independent of etymological association. Consult Paris *Figaro* (10 April 1915); London *Spectator* (4 Sept. 1915); *Literary Digest* (New York, 6 Nov. 1915, p. 1012).

BOCHER, bo'shā, **Maxime**, American mathematician: b. Boston, 28 Aug. 1867; d. 12 Sept. 1918; educated at Harvard and Göttingen, became instructor 1891, assistant professor 1894, and professor of mathematics in Harvard 1904; 1908–10 he was president of the American Mathematical Society. His published works include ‹Introduction to Higher Algebra› (1907); ‹Introduction to the Study of Integral Equations› (1909); and he was one of the editors of the ‹Annals of Mathematics,› of the ‹Transactions› of the American Mathematical Society, and collaborator on the ‹Encyclopädie der mathematischen Wissenschaften.›

BOCHNIA, bōн'nē-a Poland, town in the government of Lemberg, Galicia, near the Raba, 25 miles east-southeast of Cracow. It is tolerably well built, with several churches, a gymnasium, a grammar and other schools and a board for the regulation of mines and salt works. The salt mines here employ 500 persons, and yield 15,000 tons per annum. It is the seat of thriving industries and trade. Pop. of judicial district 47,987, including 3,000 Jews.

BOCHUM, bŏн'oom, Prussia, town in the government of Arnsberg, province of Westphalia, five miles east-northeast of Essen and between 20 and 30 miles northeast of Düsseldorf. It is on the railway from Dortmund to Duisburg, and has important iron, steel and coal mining industries. It contains several churches, a school of mining and metallurgy, a gymnasium and theatre. Among its industrial establishments are steel works, iron foundries, tin and zinc factories, carpet factories and paper roofing manufactories. The waterworks are municipal property and the town has a modern sewage system. The government is vested in a municipal council of 24 members who elect an executive board of seven. Pop. 136,916.

BOCK, Jerome, German botanist, better known under his Latin name of Cragus: b. Heidesbach 1498; d. Harnbach 1554. He was a schoolmaster, and then a physician. Bock may be considered as one of the founders of modern botany; he was the first who endeavored to form a natural botanical arrangement. He is the author of a ‹Herbal of German Plants.›

BOCK, Karl Ernst, German anatomist: b. Leipzig 1809; d. 1874. He studied at the University of Leipzig, and at the outbreak of the Polish revolution he went to Warsaw, where he acted as hospital physician, first in the Polish service and later in the Russian. In 1839 he was elected extraordinary professor in the University of Leipzig. His title to fame rests chiefly on his ‹Handbook of Human Anatomy.›

BOCK BEER, a strong beer, the first drawn from the vats in the spring, when the winter's brew of lager beer is broached. See Beer Brewing.

BÖCKLIN, bėrk-lĭn, **Arnold**, Swiss painter: b. Basel, 16 Oct. 1827; d. 1901. He studied at the Düsseldorf Academy and also at Brussels, Paris and in Italy, devoting himself mostly to landscape painting. A contract to decorate the dining-hall of a villa summoned him to Hanover; in 1856 he went to Munich, where Count Schack became his patron In 1858 he became teacher in the art school at

Weimar; in 1866–71 he was in Basel; in 1871 he returned to Munich and lived also in Zürich and Florence. He is in the first rank of landscape painters, showing a real poetic power and wealth of coloring, yet his most poetical conceptions in landscape painting are often marred by the figures introduced. Among his most notable paintings are ‘Venus Reposing’; ‘Pan in the Rushes,’ now in the Munich Gallery; ‘Castle by the Sea Surprised by Corsairs’; ‘Villa by the Sea’; and ‘The Isles of the Blessed,’ in National Gallery, Berlin. Among public art collections the Schack Gallery, Munich, has the largest number of Böcklin's works. He is well represented, however, in the Basel Museum and the Freiherr von Heyl collection, Darmstadt. But very many of his best works are privately owned in Germany and Switzerland. Consult Brockhaus, Heinrich, ‘Arnold Böcklin’ (Leipzig 1901); Lehrs, ‘Arnold Böcklin, ein Leitfaden zum Verständnis seiner Kunst’ (Munich 1897); Ostini, in ‘Künstler Monographien’ (Bielefeld 1904); Würtemberger, ‘Arnold Böcklin’ (Berlin 1912).

BOCLAND, BOCKLAND, or **BOOKLAND,** one of the original English modes of tenure of manor-land which was held by a short and simple deed under certain rents and free services. It is contrasted with folcland, or land held by customary law and without written title. Bocland differed from most other forms of tenure in that it derived all its qualities and incidents from the charter creating it. Every tenure of bocland might be different from every other as to alienability, heritability, etc. Consult Digby, ‘Introduction to the History of the Laws of Real Property’ (4th ed., Oxford 1892); Pollock, ‘The Land Laws’ (London 1887); Pollock and Maitland, ‘History of English Law’ (2d ed., Boston 1899); Kemble, ‘Anglo-Saxons’; Stubbs, ‘Constitutional History of England.’

BOCOCK, Thomas S., American politician: b. Buckingham County, Va., 1815; d. Appomattox County, Va., 6 Aug. 1891. He was graduated at Hampden-Sidney College, pursued the study of law and after his admission to the bar practised law at Appomattox Court-House, Va. He was a member, for several years, of the Virginia house of delegates and was attorney for the State in 1845–46, being elected in the latter year a representative in the 30th Congress on the Democratic ticket. He sat for seven successive terms until the Ordinance of Secession was enacted. In 1861 he was elected to the Confederate Congress and speaker of the Confederate House of Representatives on its permanent organization, 18 Feb. 1862.

BOCQUILLON-WILHEM, bō'kē'yoṅ' vē'lan, **Guillaume Louis,** French musician: b. Paris 1781; d. 1842. As superintendent of music in the public schools (1835), and in the universities (1838), from the classes he then instituted, together with workingmen's evening classes later, arose the Orphéon and the French system of choral societies. He was a pupil of the Paris Conservatoire, composed music to Béranger's lyrics, and was author of several valuable textbooks on singing.

BOCSKAY, bŏch'kō-ẹ, **Stephen,** Hungarian national leader: b. 1556; d. 1606. He was educated at the court of the Báthorys. In 1604, when the Emperor Rudolf II attempted to suppress Protestantism in Hungary, a rebellion broke out, and Bocskay joined the malcontents and became their leader. He was well supported by the people, drove back the Emperor's troops and was made Prince of Transylvania. In 1606 he concluded the Peace of Vienna with the Emperor, and this secured religious freedom to Hungary for a long time. It is supposed that Bocskay was poisoned by his chancellor. Consult Szilágyi, ‘Monumenta Comitialia Regni Transylvaniæ’ (Budapest 1879).

BODE, Boyd Henry, American philosopher: b. Ridott, Ill., 4 Oct. 1873. A graduate of Yankton College, South Dakota, and Ph.D. of Cornell University (1900), he was assistant professor of philosophy at the University of Wisconsin until 1909, when he received the appointment of professor at the University of Illinois. He is a member of the American Philosophical Association and was vice-president of the Western Philosophical Association, 1911–12. He is author of ‘An Outline of Logic’ (1910).

BODE, bō'dạ, **Johann Ehlert,** German astronomer: b. Hamburg, 19 Jan. 1747; d. 23 Nov. 1826. He gave the first public proof of his knowledge by a short work on the solar eclipse of 5 Aug. 1766. The approbation which this received encouraged him to greater labors, and in 1768 appeared his ‘Introduction to the Knowledge of the Starry Heavens’ (11th ed., 1858). In 1772 the Berlin Academy chose him their astronomer, and 10 years after he was made a member of that institution. His best works are his ‘Astronomical Almanac’ (commencing 1774) — a work indispensable to every astronomer,— and his large ‘Celestial Atlas’ in 20 sheets, in which the industrious editor has given a catalogue of 17,240 stars (12,000 more than any former charts). In 1825 he was released, on his own wish, from his duties in the Academy of Science and the observatory in Berlin. His place was filled by Professor Encke. His empirical law as to the distance of the planets is well known. See BODE'S LAW.

BODE, Wilhelm von, German art-critic and archæologist: b. Kalvörde, Brunswick, 10 Dec. 1845. He first intended to become a lawyer, but was so attracted by the arts that he renounced this idea and took up the study of archæology in Berlin, Göttingen and then in Vienna. In 1872 he became an assistant at the Royal Museum of Berlin, in the department of Christian plastics, having the directorship in it conferred on him in 1880. He had already given proof of his remarkable ability to build up a collection both in his own department and in that of paintings. In 1890 he was advanced to the position of director of the Picture Gallery, a place that he has since continued to fill with great distinction. Bode was made privy councillor in 1909 and was elevated to the hereditary nobility in 1914. He is a member of the academies of Amsterdam, Berlin and Munich. He acts in at least an advisory capacity for numbers of other art institutions in Germany, and his labors have gone so far afield as to include the cataloguing of the bronzes in the collection of Mr. J. Pierpont Morgan. His word is almost law among German art-lovers and they have responded times without number to his appeals for support when important art objects have come on the market — to go almost inevitably to the enriching of the national museums. An idea of the breadth of his attainments may be gained from the titles of the authoritative works he has published on such subjects as ‘Studies in the History of Dutch Painting’ (1883); his editing of the 4th to 8th editions of Burckhardt's ‘Cicerone’; ‘Donatello in Padua’ (1883); ‘Italian Sculptors of the Renaissance’ (1887); ‘Rembrandt’ (with Hoffstede de Groot 1897–1900), and ‘Rugs and Carpets of the Near East in Ancient Times’ (1901).

BODENSTEDT, bō′dĕn-stĕt, **Friedrich Martin von,** German poet and miscellaneous writer: b. Peine, 22 April 1819; d. 1892. He studied at Göttingen, Munich and Berlin, and became tutor to the young Prince Gallitzin at Moscow. In Moscow he made excellent translations of poems by Pushkin, Kazlov and Lermontov (1843). Having obtained an educational appointment at Tiflis, he pursued Oriental studies under a Tatar teacher, Mirza-Schaffy. Later he published a work on the peoples of the Caucasus (1848) and ‘A Thousand and One Days in the East’ (1849–50), which were very successful. In 1854 he was appointed professor of Slavic at Munich and in 1858 was transferred to the chair of Old English. He subsequently was theatrical director at Meiningen and traveled and delivered lectures in the United States in 1881. Among the best of his poetical works are the ‘Songs of Mirza-Schaffy,’ purporting to be translations from the Persian but really original, which have passed through more than 150 editions. A continuation, ‘Aus dem Nachlass des Mirza-Schaffy’ (1874), was less successful. He published translations from Marlowe, Ford, Webster, and other contemporaries of Shakespeare, translated Shakespeare's ‘Sonnets’ and, with other writers, joined in a new translation of Shakespeare's dramatic works (9 vols., 1866–72). Consult his autobiographical ‘Erinnerungen aus meinem Leben’; Baker, ‘Literary and Biographical Studies’ (London 1908); Stern, ‘Studien zur Litteratur der Gegenwart’ (Dresden 1895).

BODE'S LAW, an empirical law formulated by the German astronomer Bode (q.v.) to give the arithmetical relation subsisting between the distances of the planets from the sun. It may be thus stated: Write, in the first instance, a row of fours, and under these place a geometrical series beginning with 3 and increasing by the ratio of 2, putting the 3 under the second 4, and by addition we have the series 4, 7, 10, etc., which gives nearly the relative distances of the planets from the sun.

4	4	4	4	4	4	4	4	4
	3	6	12	24	48	96	192	384
4	7	10	16	28	52	100	196	388

Thus, if 10 be taken as the distance of the earth from the sun, 4 will give that of Mercury, 7 that of Venus, and so forth. The actual relative distances are as follows, making 10 the distance of the earth:

Mercury	Venus	Earth	Mars	Asteroids	Jupiter	Saturn	Uranus	Neptune
3.9	7.2	10	15.2	27.4	52.9	95.4	192	300

Close as is the correspondence between the law and the actual distances, no physical reason has been given to account for it, although there is little room for doubt that such exists. Kepler was the first to perceive the law, and Bode argued from it that a planet might be found between Mars and Jupiter to fill up the gap that existed at the time in the series. The discovery of the planetoids has proved the correctness of this prediction.

BODIE, or **BODY'S ISLAND,** N. C., an island of sand in Dare County, between the Atlantic Ocean and Albemarle and Roanoke sounds. The sand shifts often and inlets from the ocean appear and disappear. There is a lighthouse with a first-class light on the island, in lat. 35° 49′ N. and long. 75° 33′ W. and 155 feet above sea-level.

BODIERON, bō-dĭ-ē′rŏn, a fish (*Hexagrammus lagocephalus*) of Puget Sound, similar to the rock-trout but having greenish-colored flesh. The Indians of Cape Flattery term it boregat. See ROCK-TROUT.

BODIN, bō-dȧn, **Jeaṅ,** French scholar and innovator in economic and political theory: b. Angers 1530; d. Laon 1596. He studied law in Toulouse and after a lectureship in that then notable school attempted without distinguished success the practice of law in Paris. This he presently abandoned for political and economic study, lightened by the favor of Henry III, with whom he was for a time intimately associated, as afterward with the King's brother, the Duc d'Alençon, whom he accompanied to England in his suit for the hand of Queen Elizabeth. His first book was a translation of Oppian's ‘Cynegetigon,’ a hunting manual, into Latin verse. The first of serious significance was the ‘Discours sur les causes de l'extrême cherté qui est aujourdhui en France’ (1574). This was an enlightened contribution to the theory of prices, a matter to which he recurred in the sixth book of his most notable work, ‘The Republic,’ and in a refutation of the assertion of Malestroit that there had been no rise in prices for three centuries, the ‘Responsio ad paradoxa Malestretti,’ which contains the first satisfactory explanation of the revolution in prices during the 16th century and treats sanely of the relation of money to prices and to wages. He showed here that the amount of money in a land is no gauge of its wealth and was among the first to see the futility of prohibiting the export of gold and silver. In 1576 Bodin was made king's attorney and elected a member of the Third Estate for the States-General at Blois. Here he defended brilliantly freedom of conscience, under very difficult conditions, resisting both clergy and nobility in their desire to enforce conformity. He also resisted the desire of the King for authority to alienate public lands and so lost the royal favor by his defense of the people's rights. In 1577 appeared his ‘Six livres de la republique,’ a book often reprinted and regarded by some as entitling its author to rank, with Aristotle and Montesquieu, among the greatest of political philosophers. ‘The Republic,’ though clumsy in arrangement and inexact in citation, was the first attempt since Aristotle's ‘Politics’ to build a complete system of political science. Noteworthy is the constancy with which the higher aims and purposes of society are kept in view. He declared public finance to be «the sinews of the state» and showed enlightened ideas on taxation and in the defense of the right of private property against the utopian theory of More. Governmental intervention in trade and commerce was approved. The study of the effect of climate on society and government was novel and influenced Montesquieu. In government he thought the will of the people should find orderly expression but that the sovereign should be «absolute and subject to no law.» Finding on a visit to Oxford and Cambridge in 1581 that 'The Republic' was known there only in a bad Latin version, he published a translation of his own in 1586. That he was not wholly above the grosser superstition of his time appears from the belief in witchcraft shown in his 'Démonomanie des sorciers' (1580). He declared for the League in 1589, for Henry IV in 1594 and died of the plague in 1596. He left unpublished a 'Colloquium Heptaplomeron,' first printed 1847, a conversation between a Catholic, Lutheran, Zwinglian, Jew, Mohammedan, Epicurean and Theist, looking to the widest tolerance consistent with public morals and the national well-being. Consult Barthélemy, 'Étude sur J. Bodin' (Paris 1876); Dunning, 'Political Theories from Luther to Montesquieu' (New York 1905), and Fournol, 'Bodin, prédécesseur de Montesquieu' (Paris 1896).

Benjamin W. Wells.

BODKIN, (1) an instrument used by women of ancient times to fasten the hair, worn at the back of the head; it was commonly employed by the priests of Cybele and by the female characters in Greek plays. The peasant girls of Naples still wear a form of bodkin, often of silver; (2) a sharp instrument for piercing holes in cloth; (3) a blunt instrument with an eye, for drawing tape, etc., through hems; (4) a small tool used by printers.

BODLE, or **BODDLE,** a copper coin formerly current in Scotland, of the value of two pennies Scotch, or the sixth part of an English penny. It is said to have been so called after a mintmaster named Bothwell of the time of Charles II, when these coins were first issued.

BODLEIAN, bŏd-lē'ạn, **LIBRARY,** the public library of the University of Oxford, so called from Sir Thomas Bodley (q.v.) who restored it toward the close of the 16th century, many of the previous collections of books and manuscripts having been destroyed during the reign of Edward VI. Besides restoring the building and providing a fund of $10,000 for the purchase of books, he presented a collection which was valued at $50,000, and left an estate for the maintenance of officers and for keeping the library in repair. For the government of the library he drew up certain statutes, which were afterward incorporated with those of the university. The library was first opened to the public 8 Nov. 1602. The liberal example of Bodley was soon followed by the Earl of Essex, who presented part of the Portuguese bishop Osorius' library, which had been captured by Essex in 1596, shortly after the expedition against Cadiz. After the death of Bodley, the Earl of Pembroke added a valuable collection of Greek manuscripts procured by Baroccio, a Venetian. At later dates Sir Thomas Roe, Sir Kenelm Digby, the «learned Selden,» Gough the antiquary, and Archbishop Laud made donations of valuable Greek, Oriental and German manuscripts to this magnificent library. The library of the Hebrew scholar Oppenheim, rich in rabbinical lore, a great collection of Eastern manuscripts, of early editions of the Bible, original editions of ancient and classic authors, together with 50,000 dissertations by members of foreign universities, and an extensive collection of medals, coins, prints, etc., were also subsequently deposited in this library. In 1809, Clarke, the traveler, gave to it some rare Greek and Latin manuscripts, including a 'Plato' from the Isle of Patmos. In 1818 an exceedingly valuable collection of Hebrew, Greek and Arabic manuscripts procured from Venice was added, together with a portion of the famed library of Richard Heber (1834), and lastly, the rare books, manuscripts and coins of the scholar, antiquary and Shakespearean commentator, Francis Douce. This renowned library, in fine, is rich in many departments in which other libraries are deficient, and forms altogether the noblest collection of which any university can boast. It is constantly increasing by donations, by copies of every work printed in the United Kingdom, as well as by books purchased from the fund left by Bodley, and by a proportion of fees received at matriculation. It is now estimated to contain upward of 1,000,000 bound volumes, and between 30,000 and 40,000 manuscripts. The first catalogue of the printed books was issued by Dr. James in 1605. The library is open on lawful days from 9 till 5; but its admirable adjunct, the Ratcliffe Camera, in which most modern books are stored and which comprises a select library and reading room for students, is open from 10 A.M. till 10 P.M. Consult Macray, 'Annals of the Bodleian Library' (Oxford 1888); Clark, 'A Bodleian Guide to Visitors' (1906).

BODLEY, John Edward Courtenay, English historian: b. 6 June 1853. He was admitted to the bar of the Inner Temple in 1874 and was graduated at Balliol College, Oxford, 1877. He was private secretary to the president of the local government board, 1882–85. His works include 'France' (2 vols., 1898); 'The Coronation of Edward VII' (1903); 'The Church in France' (1906); 'Cardinal Manning and other Essays' (1912), etc.

BODLEY, Sir **Thomas,** English scholar, and founder of the Bodleian Library (q.v.) at Oxford: b. Exeter 1545; d. London 1612. He was educated partly at Geneva, whither his parents, who were Protestants, had retired in the reign of Queen Mary. On the accession of Elizabeth they returned home and he completed his studies at Magdalen College, Oxford, where he was graduated in 1563. He afterward became a fellow of Merton College and read letters on the Greek language and philosophy. He went to the Continent in 1576 and spent four years in traveling. His proficiency in languages led to his being employed in various embassies to Denmark, Germany, France and Holland. In 1597 he returned home and dedicated the remainder of his life to the re-establishment and augmentation of the public library at Oxford.

This he accomplished, procuring books and manuscripts himself, both at home and abroad, at a great expense, and by his influence and persuasion inducing his friends and acquaintances to assist in his undertaking. Sir Robert Cotton, Sir Henry Savile and Thomas Allen, the mathematician, were among the principal contributors. The library was opened in 1602, the first public library in Europe. It received so many augmentations that Sir Thomas Bodley, who was knighted in 1604 by James I, was induced to erect an additional structure for the reception of the increasing quantity of valuable books and manuscripts. He was accorded an elaborate funeral (for the expenses of which he left a sum of £666) in Merton Chapel. He bequeathed nearly the whole of his property to the support and augmentation of the library. Consult 'Reliquiæ Bodleianæ' (London 1703).

BODMER, bŏd'mār, **Georg,** Swiss mechanic: b. Zürich, 6 Dec. 1786; d. Zürich, 29 May 1864. He invented the screw and cross wheels and made valuable improvements in firearms and in various kinds of machinery, particularly in that of wool spinning.

BODMER, Johann Jakob, German-Swiss literary critic: b. Greifensee, Switzerland, 19 July 1698; d. Zürich, 2 Jan. 1783. With Breitinger from 1721–23 he issued the periodical *Diskurse der Maler,* in which German poetry was severely criticised for its servility to French models. Based on national and ancient standards, he formed a German literary school in opposition to Gottsched of Leipzig, with whom he carried on a prolonged controversy to the final discomfiture of his opponent. He translated Milton's 'Paradise Lost,' wrote poems and dramas of no signal merit, but published valuable editions of older German poets. For 50 years he was professor of Swiss history and politics in Zürich. Bodmer was appointed professor of history at Zürich in 1725. Perhaps his greatest service to German letters were his editions of the 'Minnesingers' and of part of the 'Nibelungenlied.'

BODONI, bō-dō'nē, **Giambattista,** Italian printer and type-cutter: b. Saluzzo, Piedmont, 1740; d. Padua, 29 Nov. 1813. His father owned a printing establishment at Saluzzo, and he began, while yet a boy, to employ himself in engraving on wood. In 1758 he went to Rome and was made compositor on the press of the Propaganda. He there made himself master of Oriental languages and restored in place the types of several alphabets which had fallen into disorder. About 1766 Bodoni was placed at the head of the Duke of Parma's private press, which he made the first of the kind in Europe, and gained the reputation of having far surpassed all the splendid and beautiful productions of his predecessors in the art; but the intrinsic value of his editions is seldom equal to their outward splendor. His Homer is a magnificent work; indeed, his Greek letters are the most perfect imitations of Greek manuscript that have been attempted in modern times. He printed the Lord's Prayer in 155 languages. His splendid editions of Greek, Latin, Italian and French classics are highly prized.

BODY COLOR, a term applied to such pigments as have body enough to be opaque, as distinguished from those which are transparent. As a rule, pigments have more body the nearer they approach to white, consequently the light parts of pictures in oil are in body color to give them brightness and strength, while the dark parts are transparent to give them depth. Water-color painting, when executed by mixing the pigments with water after the manner of an oil painting, is said to be painted in body color.

BODY OF LIBERTIES. See LAW.

BODY AND MIND, in philosophy, the problems of the reality of mind and body, and of the relations conceived to exist between them. Mind and body, positing temporarily their reality, may first be regarded from the point of view of correlated action. Generally experience reveals indisputably the intimate relation which exists between the constitution and modifications of bodily functions and the character and alterations of consciousness. Consider the following: the dependence of certain forms of consciousness upon the functioning of the senses; modifications due to injury by a blow, on lesion in the cerebral cortex; effect of loss of sleep upon attention; effect of the use of certain drugs; pleasures and pains resulting from functioning of sense; feeling of effort which accompanies bodily work; the phenomena of sleep; diseases of memory and will, double personality; phenomena of hypnotism, hallucination, etc.; the evidence from heredity, sexual differences and other allied phenomena. All these, as facts, afford an indisputable conclusion concerning the correlated action of mind and body.

But difficulties arise as soon as we undertake to state the nature of the relations which exist between them. The general truth which the phenomena referred to appear to establish, that every psychosis has its concomitant neurosis and every neurosis a concomitant psychosis, is not entirely borne out in fact. The former part of the statement is indubitable; the latter by no means so. Mental activity always involves nervous activity, but the nervous system does work other than that connected with mind. Moreover, the precise interconnections of mental fact with cerebral fact, and vice-versa, is not only not known, but the specific character of the neurosis concomitant with the psychosis is perhaps impossible of final analysis. But until these phenomena are understood, the nature of the relations of body and mind cannot be finally determined. However, physiological psychology has successfully established certain general conclusions concerning the existence of uniform relations between concomitant psychical and neural processes. The most obvious of these is the time-order or synchronous occurrence of the two series of events. The remainder are concerned, in the main, with variations of intensity, quality, combination and complexity. Qualitative psychical differences, however, are not accompanied by corresponding differences of molecular movement. These are quite different from the corresponding sensational differences.

Philosophical systems, from the days of Greek thought (see ANAXAGORAS; ARISTOTLE) down to the present, have taken up the problem where psychology leaves off. These systems may be divided into dualism and monism.

According to dualism, the first and crudest theory of which was promulgated by Descartes, both mind and body are real existences, and their relations must accordingly be determined. The problem assumes two forms, the epistemological and the genetic. According to the former of these a knowledge of both body and mind is posited. Various theories concerning their interaction then arise, such as the causal relation, parallelism, pre-established harmony, and occasionalism. The first of these is not only the most important but the philosophical conceptions concerning it may be said to strike at the inmost heart of the problem and their assumption determine the acceptance or rejection of general theories. Physiological psychology has demonstrated the temporal concomitance of the psychosis with the intermediate central portion of the neurosis. But we have certain neuroses revealing physiological processes devoid of conscious concomitant. Now, the question arises: How may this partial parallelism be accounted for? Is there a causal relation such as our initial phenomena seemed to indicate, or have we only the appearance of it in a general parallelism? Science has failed to afford precise answers to these questions. According to it the series of nervous events is complete in itself and self-sufficient. Hence, since antecedent events fully account for consequent ones, consciousness can have no causal action upon the neural series. Consciousness, then, is a mere accident and without determining power in any series. This gives us the doctrine of human automatism, according to which all our nervous actions are determined, and consciousness is an unnecessary attachment. On the other hand, others regard psychical phenomena as having a reality equal to that of physiological phenomena. They acknowledge generally the conditioning effect of nervous processes upon mental ones, but they divide again on the question of the reality of causal connection. Finally the genetic view traces its distinction of mind and body upon the dualism which a development theory in general appears to demand; or it accepts it as an hypothesis, uncritically examined, but convenient for practical purposes.

It is the attempted unification of mind and body which brings us to the doctrine of monism. Under this general theory we find spiritual monism, materialism, panpsychism, epiphenomenon, mind-dust, etc. The most obvious means of reconciliation is that of resolving either one of the ultimate factors into the other. The metaphysical conception of materialism is the doctrine by which all substance whatsoever is conceived of as being reduced to matter, of which conscious mind is but a product. The chief objections urged against it are (1) that it makes our mental states, which of all knowledge we know most immediately and directly, subordinate to our indirect and inferential knowledge of things; (2) that consciousness is a reality distinct from material phenomena, and therefore incapable of being analyzed into it; and (3) that no external world is possible apart from a perceiving subject. Spiritualism, on the other hand, escapes these objections by positing mind as the primordial substance, and further regarding material things as in themselves essentially expressive of spirit. It encounters, however, certain difficulties in the concomitance and juxtaposition of its elements for which, as yet, it has afforded no adequate solution.

According to Spinoza's doctrine of monism, both spirit and matter, or the mental and the material, are posited as real, self-existent realities, but not standing independent of each other. There is a common «substance,» and in this, consciousness and extension, the fundamental attributes of external reality, find themselves connected. Hence the doctrine is neither purely materialistic nor purely spiritualistic, but includes both these theories. The parallelism which physiological psychology demonstrates, then, in the two classes of phenomena, indicates not only their ultimate inseparability, but the fact that they are but different modes of manifestation of a common substance. Manifestly, then, this doctrine calls for no interaction theory and disposes of the troublesome question of causal connection above referred to. There is no interaction, merely a parallelism. This parallelism, indeed, extends throughout all material objects, all of which thus assume a certain *mental* aspect also. It is at this point especially that monism parts company, in its speculation, from the teachings of non-speculative psychology, according to which mind and consciousness are invariably coextensive.

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BODY-SNATCHING. See RESURRECTIONISTS.

BOECE, bois, **BOEIS, BOETHIUS,** or **BOYCE, Hector,** Scottish historian: b. Dundee, about 1465; d. 1536. Boece studied at Dundee and then at the University of Paris, and became professor of philosophy in the College of Montaigu. Here he became acquainted with Erasmus, who professed a high esteem for him. About 1500 Boece quitted Paris to assume the principalship of the newly-founded University of King's College, Aberdeen. He was also made a canon of Aberdeen. The death of his patron in 1514 occasioned his first work — a history of the prelates of Mortlach (the original see) and Aberdeen, including the life of Bishop Elphinstone, which occupies about a third of the volume. It has been reprinted by the Bannatyne and New Spalding clubs. Five years afterward appeared the work on which his fame chiefly rests, the 'History of Scotland.' The first edition is without date but a commendatory epistle bears the date of 1527. It was written in Latin. He is distinguished by a patriotic zeal to magnify the achievements of his countrymen and by an enlightened love of political liberty in advance of the age in which he lived. In 1527 Boece received an annual pension of 50 pounds (Scots), which was to be continued «until the king should promote him to a benefice of 100 marks Scots of yearly value.» The pension was paid till 1534, when it is supposed he received the promotion — a very unsafe inference. The rectorship of Tyrie, which he held at his death, is, however, supposed to have been the promotion in question. Consult Burton, 'History of Scotland' (Edinburgh 1873), and Irving, 'Lives of Scottish Writers' (ib. 1839).

BOECKH, bėk, **August,** German classical scholar: b. Karlsruhe, 24 Nov. 1785; d. Berlin, 3 Aug. 1867. In 1803 he entered the University of Halle, where he was induced by the influence of Wolf to devote himself to the study of philology. After spending three years here and more than a year in Berlin, he returned in 1807 to his native state and in the same year became extraordinary and, two years later, ordinary professor in the University of Heidelberg. He had already acquired such renown as a scholar that in 1810 he was offered the chair of rhetoric and ancient literature in the newly-founded University of Berlin, and here he remained, enjoying this and other important offices and dignities, for the rest of his life. The works of Boeckh have made an epoch in the history of philology and archæology. In his studies of classical antiquities he set forth the principle that philology ought to be an historical method intended to reproduce the whole social and political life of any given people during a given period; and in accordance with this he divided the science into two parts: (1) Hermeneutics and Criticism; (2) the Practical and Theoretical Life of the Ancients. His views were vigorously attacked in various quarters, but the majority of German scholars gathered around him and he himself carried his views into effect in a number of important works. The most remarkable of these are the following: An edition of Pindar (4 vols., 1811–22); 'The Public Economy of the Athenians' (2 vols., 1817; 3d ed. by Fränkel, 1886), which has been translated into English; 'Metrological Investigations of the Weights, Coins and Measures of Antiquity,' and 'Documents Concerning the Maritime Affairs of Attica.' Besides these he was uninterruptedly engaged from 1815 to the end of his life in making a collection of Greek inscriptions, which he published with the title 'Corpus Inscriptionum Græcarum' and the first four volumes of which appeared at Berlin between 1824 and 1862. Other important works are 'Philolaos' des Pythagoreers Lehre' (1819); 'Metrologische Untersuchungen über Gewichte, Münzfüsse und Masse des Altertums' (1838); 'Urkunden über das Seewesen des attischen Staates' (1840); 'Sophokles 'Antigone' (2d ed., 1884); 'Encyklopädie und Methodologie der philologischen Wissenschaften' (1877; 2d ed., 1886); 'Epigraphisch-chronologische Studien' (1856), etc. The first three volumes of a collection of his minor works, edited by Ascherson, appeared during the lifetime of the author. Consult Sandys, 'A History of Classical Scholarship' (Vol. III, Cambridge 1908).

BOEHLER, bė'-lėr, **Peter,** Moravian bishop: b. Frankfort-on-the-Main 1712; d. London 1775. He was educated at Jena, joined the Moravians and was ordained to the ministry in 1737 by Count Zinzendorf. He was sent as a missionary to America and on his way stopped in England, where he made the acquaintance of Charles and John Wesley. In America he worked among the negroes in Georgia, the Germans in North Carolina (who later settled Bethlehem, Pa.) and the Indians of Pennsylvania. He went to Europe and returned to Bethlehem with a large number of Moravian colonists. The addition to the Bethlehem colony led to the foundation of Nazareth nearby. In 1742 he was made bishop of the Moravian churches in America, England, Ireland and Wales. While on an episcopal visit to his European charge he died in London. Consult Lockwood, T. P., 'The Memorials of the Life of Peter Boehler' (London 1868).

BOEHM, Sir **Joseph Edgar,** Hungarian-English sculptor: b. Vienna 1834; d. 12 Dec. 1890. He went to London in 1862 and lived there from that date, becoming a member of the Royal Academy in 1881. Among his important works are the great statue of Queen Victoria at Windsor, statues of Bunyan at Bedford, Wellington at Hyde Park Corner, Dean Stanley at Westminster Abbey, Drake at Plymouth, Carlyle on Thames Embankment, and busts of Ruskin, Gladstone and Huxley. In 1889 he was knighted. He was the fashionable sculptor of his time but much of his work fails to reach a high standard and his designs for the jubilee coinage of 1887 were very adversely criticized.

BŒHMER, Just Henning, German jurist: b. Hanover, 29 Jan. 1674; d. Halle, 29 Aug. 1749. He studied law at Jena and became professor at the University of Halle (1701) and later counsellor of state to Frederick I of Prussia and president of the university. He acquired a reputation as one of the clearest and most original thinkers of his day, especially on subjects such as ecclesiastical law. Among his well-known works are 'Introductio in Jus Digestorum' (1704) and 'Excercitationes ad Pandectas' (6 vols., 1754–64). His writings have exercised a strong influence upon Prussian law and upon the legislation of the 18th century.

BOEHMERIA, a large genus of plants of the family *Urticaceæ,* chiefly natives of tropical Asia, where various species furnish fibres used in making rope, twine, thread and cloth. *B. nivea* (China grass) is a nettle-like but non-stinging perennial herb which is propagated by seeds or root division. When once established three crops are obtained annually and the fibre removed by hand stripping, machinery or boiling in water or chemical solutions. None of these methods are wholly satisfactory, for which reason China and India, those lands of cheap hand labor, still supply the world. The fibre is used to make China-grass cloth. *B. tenacissima* (ramie) or rhea is considered by some botanists as a variety of *B. nivea.* Attempts to establish the China-grass and ramie industries in the United States have not been very successful, not because the plants cannot be raised economically, but because of the high price of labor in manufacture and the inefficiency of machines and degumming methods. Both species and several others of the genus are effective ornamental plants in borders and are hardy as far north as Washington, probably farther. Consult Dodge, 'Descriptive Catalogue of Useful Fibre Plants of the World'; Royle, 'Fibrous Plants of India.'

BŒHRINGER, George Friedrich, German theologian: b. Maulbronn (Würtemberg), 28 Dec. 1812; d. Basel, 18 Sept. 1879. After finishing his university education, he was forced to leave the country and went to Switzerland (1833) on account of his radical political ideas. There he became pastor of a church in Glattfelden (1842–53). This position he resigned to devote his time to historical studies. In his later years he became blind and his son Paul acted as his secretary and helper. He began a very ambitious attempt at an ecclesiastical history 'Die christliche Kirche und ihre Zeugen, oder eine Kirchengeschichte in Biographien' (Stuttgart 1861–74, 24 vols.), but death prevented his completing it.

BŒOTIA, bē-ō'shĭ-ạ, a country of ancient Greece, bounded north by Phocis and the country of the Opuntian Locrians, east by the Euripus or Strait of Eubœa, south by Attica, Megaris and the Alcyonian Gulf, and west by Phocis. Its surface was estimated at 1,119 square miles, but the boundaries were not always the same. In the north it is mountainous and cold and the air is pure and healthy, but the soil is less fertile than that of the other portion, which, however, is said to suffer from malaria. The mountainous part in the north was called in earlier times Aonia. Among the mountains of Bœotia are several remarkable in history and mythology — Helicon (now Zagora), the mountain of the Sphinx, the Teumessus, Libethrium and Petrachus. Hypatus (modern name Samata) bounded the Theban plain on the east. The feature of the country was Lake Copais, the district around which is a valley completely surrounded by hills and connected with the Eubœan Sea by subterranean passages. The lake was fed by the Cephisus, the largest river in the country, and the water was liable to accumulate more rapidly than the natural drainage of the country could carry it off. Hence the early inhabitants suffered much from inundations, and at a period previous to historical annals subterraneous channels were built to carry off the water, which indicate a very early civilization and recognized from the ruins which still remain as among the greatest works of antiquity. These works made Bœotia one of the most fertile districts of Greece. Recently the lake has been drained at great expense and a large tract of land reclaimed. The chief occupation of the inhabitants was agriculture and the raising of cattle. Bœotia was first occupied by the Pelasgian tribes. In the time of Bœotus (son of Itonus and grandson of Amphictyon, from whom it is said to have derived its name) these were subject to the Hellenes. It was divided into small states until Cadmus the Phœnician founded the government of Thebes. In later times all Greece worshipped the Hercules of Thebes. After the death of Xanthus, King of Thebes, most of the cities of Bœotia formed a kind of republic, of which Thebes was the chief city. Epaminondas and Pelopidas raised Thebes for a time to the highest rank among Grecian states. In Bœotia are several celebrated ancient battlefields, namely, Platæa (now the village Kokla), where Pausanias and Aristides established the liberty of Greece by their victory over the 300,000 Persians under Mardonius; Leuctra (now the village Parapogia), where Epaminondas checked the ambitious Spartans; Coronea, where the Spartan Agesilaus defeated the Thebans, and Chæronea (now Capranu), where Philip founded the Macedonian greatness on the ruins of Grecian liberty. Near Tanagra, the birthplace of Corinna, the best wine was produced; here also cocks were bred of remarkable size, beauty and courage, with which the Grecian cities, passionately fond of cock-fighting, were supplied. Refinement and cultivation of mind never made such progress in Bœotia as in Attica. The Bœotians were vigorous but slow and heavy. Several Thebans, however, were worthy disciples of Socrates, and Epaminondas distinguished himself as much in philosophy as by his military talents. The people were particularly fond of music and excelled in it. They had also some great poets and artists. Hesiod, Pindar, the poetess Corinna and Plutarch were Bœotians. Bœotia is one of the nomes in the modern kingdom of Greece, with an area of 550 square miles. The capital is Livadia. Pop. 65,816 largely Albanian. Consult Bowner, 'The Bœctian Federal Constitution' (in 'Classical Philology,' Vol. V, Chicago 1910); W. M. Leake, 'Travels in Northern Greece,' chaps. 11–19 (London 1835); W. Rhys Roberts, 'The Ancient Bœotians' (Cambridge 1895).

BOERHAAVE, boor-hä'vė, **Hermann,** Dutch physician: b. Woorhout, near Leyden, 31 Dec. 1668; d. 23 Sept. 1738. Boerhaave received from his father a liberal education. In 1682 he was sent to Leyden to study theology. In 1688 he received a gold medal from the city for an academic oration, in which he attacked the doctrines of Spinoza. In 1689 he received the degree of doctor of philosophy and maintained an inaugural dissertation, 'Destinctione Mentis a Corpore,' in which he attacked Epicurus, Hobbes and Spinoza. He commenced, at the age of 22, the study of medicine, first taking up anatomy, on which he afterward exercised a salutary influence, as the use he made of mechanical illustrations induced anatomists to apply themselves to a more accurate study of the forms of the organs. He made a special study of Hippocrates, with whose superior excellence and correct method he was forcibly struck. In 1693 he was made doctor of medicine at Harderwyck. In 1701 the University of Leyden chose him to deliver lectures on the theory of medicine. Boerhaave now began to develop those great and peculiar excellences which make him a pattern to all who undertake the office of instruction. Pupils crowded from all quarters to hear him. His method was eclectic, combining the speculations of opposing schools; but this led him to attach too much importance to mechanical and chemical theories of vital actions. In 1709 the University of Leyden appointed him to the chair of medicine and botany. The course of instruction to which Boerhaave was now devoted induced him to publish two works, on which his fame still rests, namely, 'Institutiones Medicæ' (1708), and 'Aphorismi de Cognoscendis et Curandis Morbis' (1709). In the former, which is a model of comprehensive erudition and clear method, he unfolds his system in its fullest extent; in the latter he undertakes the classification of diseases and discourses separately on their causes, nature and treatment. He rendered essential services to botany by his two catalogues of plants in the garden of Leyden by his description and delineation of new plants and the introduction of new species. In 1714 he was made rector of the university and professor of practical medicine. In the latter office he had the merit of introducing clinical instruction, that is, of lecturing to his students at the bedside of patients in hospital, for the first time in Europe. On the death of Lemort he was appointed to the professorship of chemistry, which science he had taught since 1703. His 'Elements of Chemistry' (1724), is still a highly valued book. So conspicuous was the position occupied by Boerhaave that people came from all parts of Europe to ask his advice and he raised his university to a pinnacle of fame. It is said that a Chinese mandarin wrote to him with the address, «To Boerhaave, the celebrated physician in Europe.» Boerhaave was a man of piety as well as learning. He used to say that the life of a patient, if trifled with or neglected, would one day be required at the hands of his physician. Consult Burton, 'Account of the Life and Writings of Boerhaave' (London 1743); and the life by Johnson (ib. 1834).

BOERS, bō'ōrs (Dutch *boer,* a peasant or husbandman), the name commonly applied to the South African colonists of Dutch descent. The Cape Colony was founded by the Dutch in 1652, and about 1687 the colony was increased by a number of French Huguenot settlers who were later absorbed in the Dutch population. The Dutch were at this period the leading maritime power of Europe, and their African colonies assumed great importance. When Holland was reduced to the last extremity by the invasion of Louis XIV serious thoughts were entertained of making the Cape Colony the final refuge of Dutch independence, but this crisis passed away with the advancing power of William. During the 18th century the colony was administered in the most despotic fashion by the Dutch East India Company, whose policy was to isolate it in order to have entire control of all trade, and the colonists, forced to struggle against this oppression as well as against the natives and the wilderness, began to develop a character of their own. The troubles in which the parent state was involved by European wars now began also to affect them. The colony was taken possession of by the English in 1795, restored at the Peace of Amiens in 1802, taken again in 1806, and finally ceded to England in 1815. The last change was highly distasteful to the colonists. Naturally distrustful of a foreign government, they had formed from their experience of the country and its inhabitants a policy and habits of their own, into which the newcomers could not be expected at once to enter. The Boers, moreover, were strongly conservative, believing that they understood the situation better than anyone else, and they had acquired in their struggles with the natives a reckless daring, which, added to the coolness and caution of the Dutch character, was likely to make them formidable opponents to any government which provoked their hostility.

The policy of the British governors was not always adapted to the circumstances, and the attempts of the British missionaries, encouraged by the colonial government, to convert and civilize the natives, excited the jealousy of the Boers, who thought their own interests compromised by the encouragement given to the converts. The government on various occasions sided with the Kaffirs against the Boers, which, whatever the merits of the particluar disputes, was not calculated to conciliate the latter. The emancipation of their slaves in 1834, and the cession to the Kaffirs in 1835 of a frontier district of neutral territory in the east, filled up the measure of provocation, and the Boers resolved to place themselves by emigration beyond the British rule. What is known as the Great Trek started in 1835 and continued until 1840, during which time 7,000 Boers emigrated from Cape Colony. A first band of «voortrekers» set out as early as 1833; some pushed as far north as the Zoutpausberg, near the Limpopo River; others proceeded to Delagoa Bay but died of hardship before they could form a settlement. Another band in 1835 set out for Natal, was attacked by the Matebele Kaffirs and obliged to fall back on the Modder River. After receiving reinforcements they again advanced and, settling in the Orange River district, formed a commonwealth under Peter Retief. Retief and a band of followers subsequently crossed the Drakensberg Mountains into Natal, but a number of them, including Retief, were treacherously murdered by the Zulu chief Dingana, who had given them permission to settle in the country. Those who escaped received reinforcements, made alliance with the English settlers at Port Natal, and under the leadership of Pretorius broke the Zulu power at the battle of Blood River in 1838. Two years later Dingana was slain. The Boers founded Pietermaritzburg and made it the seat of their *volksraad,* but the British colonial government denied their right to form an independent community in this district.

In 1842 a British force was landed and the Boers were compelled to retire from the coast and acknowledge the British sovereignty. Many of them recrossed the mountains and settled in the Vaal district. Further disagreements with the colonial government, which had now possession of Natal, led to another emigration to the north of the Klipp River. Here they struggled successfully with the Kaffirs till 1845, when the colonial government proclaimed the Buffalo River the north boundary of Natal. The Boers openly resisted, but finding their strength unequal to the conflict, again emigrated to the Vaal country. In 1848 the colonial government likewise annexed by proclamation the Orange River settlement. The Boers, headed by Pretorius, took up arms, but being defeated, retired beyond the Vaal, and with the previous settlers formed the Transvaal republic. Those who remained continued their resistance to the British authority until, in 1851, on the outbreak of the Kaffir War, the British relinquished the Orange River territory, and by the Sand River Convention in 1852 recognized the independence of the Orange Free State. In 1877 the Transvaal was annexed by Britain, according to the wish of many of the people, but war broke out in 1880, British forces suffered more than one defeat, and in 1881 the country was accorded a modified independence. Paul Kruger was elected president in 1883. He was a typical representative of his people, possessing many primitive virtues but intensely conservative, tenacious, doggedly independent, bigoted in his stern Calvinist religious belief. The discovery of gold in the Transvaal and the influx of Europeans following thereon created new sources of friction between the British and Boer population. Henceforth it was a common feeling among the Boers that they and not the British must be predominant in South Africa, and in October 1899, after a defiant ultimatum, the united forces of the Transvaal and Orange Free State invaded Natal. After nearly three years of warfare the two republics were annexed by proclamation. The work of reconciliation between the British and the Boers was undertaken by Lord Milner, with such success that in 1905 and 1906 constitutions were granted the Transvaal, the Boer general Botha being appointed Premier. On 31 May 1910 the Transvaal, Natal, the Cape of Good Hope and Orange River Colonies were united under one government under the name of Union of South Africa. That the reconciliation between the Boers and the British is a permanent one seems proved by the valuable services which the troops of the Union, under General Botha, have rendered the British cause during the European War by the conquest of German Southwest Africa. See JAMESON; KRUGER; MAJUBA HILL; NATAL; ORANGE RIVER COLONY; SOUTH AFRICAN WAR; TRANSVAAL; UNION OF SOUTH AFRICA, etc.

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BOËTHIUS, bō-ē'thĭ-ŭs, **Anicius Manlius Severinus**, Roman statesman and philosopher: b. about 480 A.D., in Rome or Milan; d. 524. He was educated in Rome, in a manner well calculated to develop his extraordinary abilities. Theodoric, King of the Ostrogoths, then master of Italy, loaded him with marks of favor and esteem and raised him to the first offices in the empire. He exerted the best influence on the administration of this monarch, so that the dominion of the Goths promoted the welfare and happiness of the people who were subject to them. He was long the oracle of his sovereign and the idol of the people. The highest honors were thought inadequate to reward his virtues and services. But Theodoric, as he grew old, became irritable, jealous and distrustful of those about him. The Goths now indulged in all sorts of oppression and extortion, while Boethius exerted himself in vain to restrain them. He had already made many enemies by his strict integrity and vigilant justice. These at last succeeded in prejudicing the King against him and rendering him suspicious of Boethius. His opposition to their unjust measures was construed into a rebellious temper, and he was accused of a treasonable correspondence with the court of Constantinople. He was arrested, imprisoned and executed at Pavia. He made many laborious translations of the Greek philosophers, particularly of Aristotle. These translations, and especially his commentaries on Aristotle, caused him to be regarded up till the 14th century as the highest authority in philosophy. His treatise, 'De Musica,' also supplied for many centuries the place of Greek originals. His fame now chiefly rests on his 'Consolations of Philosophy,' written in prison, a work of elevated thought and diction, and while piously theistic in its language, gives no indication of Christian belief on the part of its author. It is written partly in prose and partly in verse. The oldest edition of this work was published at Nuremberg in 1473. It was translated by King Alfred and Chaucer, and was highly prized during the Middle Ages. Boethius also translated Euclid and other Greek mathematical works into Latin, and wrote short treatises on algebra and geometry, which were used as school textbooks during the Middle Ages. The appearance in these works of characters similar to Hindu numerals has raised the question as to whether he was familiar with the works of the Hindu mathematicians. Consult Stewart, A. F., 'Boethius: An Essay' (Edinburgh 1891).

BOËTHUS, Greek sculptor: b. Chalcedon early in the 2d century B.C. He is celebrated for his statues of children. 'The Boy With the Goose' was his most famous work. A girl playing with dice and a boy extracting a thorn were subjects of other masterpieces by him. According to Pliny he excelled in working in silver. Consult *Journal of Hellenic Studies* (Vol. VI, p. 7) and *Jahrbuch d. d. Inst.* (1904, p. 212).

BŒTTCHER, bĕt'kĕr, **Jean Frederick** (his name is also spelled **BŒTTIGER**), German alchemist, the inventor of Meissen porcelain: b. Schleiz 1681; d. 1719. A man of dissolute habits and dishonorable conduct, he is celebrated for his extraordinary adventures and his fortunate discovery of the famous Dresden porcelain. Apprenticed to an apothecary in Berlin, he spent his time in the pursuit of alchemy and pretended to have made gold. This discovery, as it was believed to be, exposed him to the danger of a prosecution for sorcery, to avoid which he fled. Such was the credulity of the time that the Prussian government was anxious for his return, and the Elector of Saxony, then King of Poland, supplied him with the means of prosecuting his inquiries, and was entertained by his promises for three years. By the advice of Count Tschirnhausen, the Elector was induced to turn the real chemical knowledge and abilities of Bœttcher to account in developing the resources of the country. This sensible advice was rewarded with the discovery of a red clay at Meissen, from which a beautiful porcelain could be made. Bœttcher was entrusted with the direction of the manufacture, but was so little trustworthy that he had almost to be detained a prisoner to prevent his divulging the secrets of the process. He had actually entered into a negotiation with some Prussians to do so, and his death alone saved him from the punishment of his treachery.

BOEUF BAYOU, bĕf bī'oo, stream in Arkansas and Louisiana, formed in times of high water by overflow from the Mississippi, when it affords nearly 100 miles of steamboat navigation. It is an affluent of the Washita River.

BOFFIN'S BOWER, in Dickens' 'Our Mutual Friend,' home of the Boffins. The name was given by Mrs. Boffin, who did not approve of its former name, «Harmon's Jail.»

BOG, an Irish word, literally meaning soft, applied in Great Britain to extensive districts of marshy land, such as we commonly call in this country swamps. They consist, in Europe, so universally of peat, that this substance is there generally regarded essential to a bog. As we use the word, it is in the sense of a quagmire; any soft and wet spot into which a man would sink in attempting to cross it, being called a bog. The true bog is most commonly found in northern latitudes, and in districts where great humidity prevails. Their situation is not necessarily low, nor their surface level. Some of the great Irish bogs present even a hilly appearance, which, perhaps, is the result of the spread of the mosses in their lateral growth from lower situations over intervening higher grounds. Bogs were formerly supposed to owe their origin to the destruction of forests, and in particular to the obstructions of drainage from fallen trees, causing lodgments of water, and favoring the growth of marsh plants. This theory can only be partially true. Fallen trees and also standing roots are frequently found in a state of great preservation in bogs, but the agency of felled trees in the production of bog has been completely disproved, six or seven feet of bog being found under the roots of remaining trees, showing the previous formation of the bog. The process of bog formation is thus described: When a shallow pool induces the formation of aquatic plants, they gradually creep in from the borders to the deeper centre. Mud accumulates round their roots and stalks, and a spongy semi-fluid mass is formed, well suited for the growth of moss, particularly Sphagnum, which now begins to luxuriate, continually absorbing water, and shooting out new plants above as the old decay beneath; these are consequently rotted, and compressed into a solid substance, gradually replacing the water by a mass of vegetable matter. A layer of clay, frequently found over gravel, assists the formation of bog by its power of retaining moisture. When the subsoil is very retentive, and the quantity of water has become excessive, the superincumbent peat has sometimes burst forth and floated over adjacent lands. This happened near Killarney in 1896, and caused the loss of nine lives. Quagmires are caused by the decay of the roots of plants underneath. The plants thus detached from the bottom rise to the surface, and are kept floating in moisture. Elastic under light pressure, they yield suddenly to the weight of heavy bodies, their only strength consisting in the interlacing of their decayed fibres.

Throughout the country, along the seaboard to the Gulf of Mexico, bog-like swamps are of frequent occurrence. Their outer portions are sometimes wooded swamps, while within they present moss-covered heaths, stretching, like the Western prairies, farther than the eye can see, and dotted occasionally with clumps or little islands of trees. In New England, the Northwestern States and Canada, the bogs furnish genuine peat, and some of those bordering on the Great Lakes are of great extent. On Long Island, near New York, the bogs present a marked feature along the sandy coast.

British bogs are generally divided into two classes — red bogs, or peat mosses, and black bogs, or mountain mosses. The former class are found in extensive plains frequently running through several counties. The Chat-moss in Lancashire, and the Allen in Ireland, are examples of this class. Their texture is light and full of filaments, and is formed by the decay of mosses and plants of different kinds. The color becomes darker, and density increases with the depth of the bog. The lower parts, being more entirely decayed, approach nearer to the nature of humus than the upper portion. They are also more carbonaceous, and consequently more valuable for fuel. The depth of the red mosses varies from 12 to 42 feet. The chief reasons of the unproductiveness of this class of bogs are the acids in which the plants composing them abound, and which are noxious to the higher orders of vegetation, and the circumstance that the decomposition of the plants takes place under water, where they are excluded from the action of the oxygen and nitrogen of the air, and consequently deprived of the power of evolving carbon and ammonia. Black bog is formed by a more rapid decomposition of plants. It is heavier and more homogeneous in quality. It is common in Ireland and Scotland, but is usually found in limited and detached portions. In Ireland these frequently rest on calcareous subsoil, which is of great value for reclaiming them. The black bog is so frequently found at high elevations that its reclamation presents considerable difficulties, but when it is found in plains or gentle inclinations it may be reclaimed with comparative ease. The soil in mountainous districts, being shallow, is not suited for cereals, but if the mistake of sowing these is avoided, they may be made into good pasture land. The reclamation of the extensive red bogs found in various parts of the country, especially in Ireland, which has more than 1,500,000 acres of them, has long occupied attention; but the progress of improvement has been hindered by questions of land tenure, disposal of capital and other difficulties external to the practicability of the desired reformation. Many extensive experiments have, however, been made with encouraging success, and while it is perhaps doubtful how far reclamation will repay the immediate improver, it appears from a national point of view to offer undoubted advantages.

In the reclamation of bog land three things require to be accomplished. The land must be thoroughly drained, and a permanent system of drainage established. The loose and spongy soil must be mixed with a sufficient quantity of mineral matter to give the requisite firmness to its texture, and to fertilize its superabundant humus. Proper manures must be provided to facilitate the extraction of nutriment from the new soil, and a rotation of crops suitable for bringing it into permanent condition adopted. The difficulties of reclamation lie chiefly in the first and second of these requirements.

The materials best adapted for reclaiming peat are calcareous earths, limestone gravel, shell marl and shell sand. Caustic lime, although it neutralizes the acids of the soil, causes too rapid a decomposition of the vegetable matter. These materials are frequently found in the subsoil or in the neighborhood, but the labor of raising them from the subsoil is often greater than that of bringing them from other quarters.

Paring and burning, or removing a portion of the peat for fuel, when the subsoil is good, are other modes of facilitating improvement. The limited demand for peat fuel prevents the latter system being carried on extensively. Thoroughly reclaimed bogs are not liable to revert to their former condition. (For further particulars see CHATMOSS). It was probably in bogs of a nature similar to those above described that much of our coal was formed.

BOG-BUMPER, BOG-JUMPER, or **BOG-PUMPER,** names for the bittern (q.v.).

BOG-BUTTER, a fatty spermaceti-like substance found in masses in peat-bogs, composed of carbon, oxygen and hydrogen, and for years supposed to have been formed by the decomposition of peat. In 1885 Macadam proved that it is of animal origin, as all of the samples analyzed showed the presence of hairs identical with those of a cow; the substance being, in fact, a variety of adipocere formed by the decomposition of animal substances out of contact with the air. It becomes liquid at 123.8° F.

BOG IRON ORE, a variety of limonite formed in bogs and swamps by the reducing action of decaying vegetable matter on soluble iron salts. It is generally loose textured and brown or brownish-yellow in color. The ore usually contains such a high percentage of impurities, especially sulphur and phosphorus, that it cannot be utilized for iron manufacture; it is sometimes so used, however, and it also finds limited application in the purification of illuminating gas. Deposits of bog iron ore are widespread. In the United States extensive beds occur along the Atlantic coast from New York southward, and the first blast furnaces erected in this country were supplied from them. Similar deposits occur in Great Britain and most of the countries of Europe. In the Three Rivers district of Quebec such ore accumulates so rapidly that a six-inch layer is said to be dredged from shallow lakes every 10 years.

BOG-MOSS. See SPHAGNUM.

BOG-OAK, trunks and large branches of oak found imbedded in bogs and preserved by the antiseptic properties of peat, so that the grain of the wood is little affected by the many ages during which it has lain interred. It is of a shining black or ebony color, derived from its impregnation with iron, and is frequently converted into ornamental pieces of furniture and ornaments, as brooches, earrings, etc.

BOG-TROTTER, a name contemptuously applied to the lower classes of the Irish peasantry on account of their ability to make their way across the bogs where no one else can find footing, which frequently gives them a means of escape from officers of police and other pursuers.

BOGAERS, bō'gärs, **Adriaan,** Dutch poet: b. The Hague 1795; d. 1870. He was educated in law at Leyden, practised his profession at Hoorn and from 1830 to 1851 was a judge at Rotterdam. He holds an eminent place among the many disciples of Tollens and surpasses his master in correctness of taste. He long withheld his compositions from publication and not till 1832 did he become known to his countrymen; he then published his first lyric poem, 'Volharden,'— an appeal to his countrymen to stand fast in the struggle with Belgium — together with other patriotic pieces. His first poem of any considerable compass, the epic 'Jochebed,' and his masterpiece, 'The Voyage of Heemskerk to Gibraltar,' were first formally published in 1860–61, though they had had for many years a private circulation among friends. He afterward published three volumes, 'Ballads and Romances,' 'Flowers of Poesy from Abroad' and 'Poems.' Two posthumous works of his were issued, entitled, respectively, 'Philological Papers' (1872) and 'Lexicon of Bilderdijk's Poetical Works' (1878). His collected poems were edited by N. Beets (2 vols., Haarlem 1871). Consult the biography by J. G. Gleichmann (Amsterdam 1875).

BOGAN, or **NEW YEAR RIVER,** a river of East Australia, rises in the Harvey Range, flows northwest and empties into the Darling River, about lat. 30° S. and long. 146° E.; length over 300 miles.

BOGARDUS, Everardus, second pastor of the church in New Amsterdam (New York): d. 27 Dec. 1647. He is noted as the husband of Anneke Jans, whose ownership of 60 acres of land in the business portion of New York has given her descendants occasion for almost continuous law suits, during 200 years, to recover possession of the property which is held by the corporation of Trinity Church. Bogardus was recalled to Holland to answer certain charges made by his ecclesiastical superiors, but lost his life by shipwreck in the British Channel.

BOGARDUS, James, American inventor: b. Catskill, N. Y., 14 March 1800; d. 13 April 1874. He was apprenticed to a watchmaker and early showed the bent of his mind by improvements in the construction of eight-day clocks and other improvements in timepieces, and by the invention of a delicate engraving machine. The dry gas metre is his invention, as is also the transfer machine to produce bank-note plates from separate dies; and in 1839 his plan for manufacturing postage stamps was accepted by the British government. Later he introduced improvements in the manufacture of india-rubber goods, tools and machinery, and invented a pyrometer, a deep-sea sounding machine and a dynamometer. In 1847 he built for his factory the first iron building ever erected in the city of New York. Later he introduced wrought-iron beams.

BOGART, John, American engineer: b. Albany, N. Y., 8 Feb. 1836; d. 25 April 1920. A graduate of Rutgers College, he entered the engineering department of the New York Central Railroad and State canals, and as Federal engineer at Fort Monroe, Va., during the Civil War. He was chief engineer of municipal works in Brooklyn, N. Y., Albany, New Orleans, Chicago, Baltimore, Rochester and New York, and superintended work on the harbors of Venezuela, the hydraulic and electrical development plants at Niagara Falls, on the Saint Lawrence River, in British Columbia and in the South. He was government representative at the International Congress of Navigation at Düsseldorf, Germany (1902); at Milan, Italy (1905); and at Saint Petersburgh, Russia (1908).

BOGATZKY, Karl Heinrich von, German devotional writer: b. Tankowa, Silesia, 1690; d. Halle 1774. His principal works are ‹Tägliches Schatz-Kästlein der Kinder Gottes,› published in 1718. The former is familiar to English readers under the title of Bogatzky's ‹Golden Treasury.› Consult biography by Kelly, published in London in 1889.

BOGDANOVICH, Ippolit Fedorovich, Russian poet: b. 23 Dec. 1743 O. S.; d. 1802. From his earliest years he showed a great love for poetry, music and painting, but when, in 1754, his parents brought him to Moscow and forced him to study law at the university, he secretly tried to go on the stage. Heraskov, the director of the theatre, succeeded in dissuading him from this purpose and urged him to dedicate himself to the literary field. His first attempts in the domain of lyric poetry (‹A Useful Joy› and ‹Leisure Hours›), although inferior, were published by the university periodicals. In 1764 he was appointed to a secretarial position in the Ministry for Foreign Affairs and two years later he was transferred to the Russian embassy at the Royal Court at Dresden. He later wound up his governmental career as president of the Imperial Archives in Saint Petersburg. His most productive period was in 1769–75, when in his ‹Lyre› he published his collective lyric poems, which were unusually well received. For his momentous song, ‹Dushenka› (‹Dear Little Soul›) he drew the inspiration, if not entirely borrowed, from La Fontaine's ‹Les Amours de Psyche› and glorified the beauty of soul as imperishable and unalterable while he spoke of exterior brilliance and beauty as being transitory and inconstant as smoke. ‹Dushenka› is replete with a light play of imagination and written in a distinguished tone with many lively and exquisite verses. The 15 editions of that poem are the best proof of its popularity, which is partly due to the fact that nothing of the kind had been previously attempted in Russia. However, later criticism does not sustain the contemporary estimate of this writer. Of his other poems ‹The Slavs,› ‹The Happiness of Nations› were well received by contemporary critics. His collective works (exclusive of his prose writings) were published by C. A. Vengerov (Saint Petersburg 1893).

BOGDOOLA, bŏg-dō-oo′lạ, or **HOLY MOUNT,** a hill in Russia, in the government of Astrakhan, near the Aktuba and 14 miles east of Tchernoiarsk. It forms an isolated cone nearly 500 feet high in the middle of a vast steppe. It appears to rest on limestone overlain by sandstone, which on the northeast side rises perpendicularly like a wall and is cut into deep clefts frequented by innumerable birds. The sandstone is succeeded by alternate red and white layers of clay and sand, which have a very singular appearance. The summit is chiefly composed of masses of rock-salt. At the foot of the hill there is a salt lake called Bogdoin Dabassu.

BOGERMAN, bō′gėr-män, **Jan,** Dutch theologian: b. Oplewert 1570; d. 1637. He was professor of divinity at the University of Franeker (1633); participated in the Armenian controversy, and was president of the Synod of Dort, 1618. With four others he translated the Bible into Dutch; this translation is at present the common Dutch version. He also wrote ‹Annotationes contra H. Grotium,› and translated Beza's ‹Del a punition des hérétiques.›

BOGERT, George H., American artist: b. New York 1864. His first studies were made under Thomas Eakins. He went to France in 1884 and studied in Paris under Raphael Collins, Aimé Morot and Puvis de Chavannes. He won the Webb prize, 1898; the first Hallgarten prize of the National Academy of Design, 1899, and was awarded a bronze medal at the Paris Exposition, 1900. His studio is in New York.

BOGERT, Marston Taylor, American chemist, lecturer and writer: b. Flushing, N. Y., 18 April 1868. A graduate in 1890 of Columbia College, he was subsequently assistant, professor and head of its department of chemistry. In 1908, at the invitation of President Roosevelt, he was a member of two conferences on the conservation of national resources and delivered important addresses on land, water, forests and minerals. In 1909 he received the degree of LL.D. from Clark University. He was elected president of the American Chemical Society 1907–09, and was a founder and president 1912–13 of the Chemists' Club. He is the author of numerous popular articles, reviews and scientific papers.

BOGGS, Charles Stuart, American naval officer: b. New Brunswick, N. J., 28 Jan. 1811; d. 22 April 1888. He entered the United States navy in 1826; served on the *Princeton* in the Mexican War; was assigned to the gunboat *Varuna* in Farragut's Gulf squadron in 1861. In the attack on forts Saint Philip and Jackson, in April 1862, he destroyed six Confederate gunboats and two rams, and in the last moments of the fight his own vessel was sunk. In 1869–70 he served with the European squadron; in the latter year was promoted to rear-admiral, and in 1873 was retired.

BOGGS, Frank Myers, American artist: b. Springfield, Ohio, 6 Dec. 1855. He received his art education at the École des Beaux Arts and under Gérôme in Paris. In 1882 the French government bought his picture, ‹Place de la Bastille,› for the Luxembourg Museum, and in 1883 his ‹Isigny› for the Niort Museum. His pictures are to be found in many of the best French private collections, and in the museums at Havre, Nantes and Dieppe. In the first prize fund exposition of the American Art Gallery, New York, he received a prize of $2,500 for his picture ‹A Rough Day, Honfleur,› now in the Boston Museum.

BOGHEAD COAL or **TORBANITE,** a bituminous substance found at Boghead, near Bathgate, Scotland. It is dark brown in color and partakes of the nature of cannel coal. It contains a large amount of volatile substance, consequently is largely used in making paraffin and gas.

BOGLE, James, American artist: b. Georgetown, S. C., 1817; d. Brooklyn, N. Y., 11 Oct. 1873. He came to New York in 1836 and entered the studio of Professor Morse, inventor of the telegraph and founder of the National Academy of Design. Mr. Bogle, confining himself to portrait painting, soon achieved distinction in that department. In 1850 he was elected an associate of the National Academy, and in 1861 an academician. For many years his pictures occupied annually a prominent position at the Academy, but he exhibited only at rare intervals in the later years of his life, when the state of his health compelled him to live in the South. He executed portraits of John C. Calhoun, Henry Clay, Daniel Webster, Chief Justice Jones, Bishop Atkinson of North Carolina, DeWitt Clinton, Gen. John A. Dix and Henry J. Raymond.

BOGNOR, bŏg'nėr, England, watering-place on the coast of Sussex, nine and a half miles southeast of Chichester by railway. There is a pier 1,000 feet long, constructed chiefly of iron, and also an esplanade. The place was brought into vogue toward the end of last century by Sir R. Hotham, who spent $300,000 on it. Pop. 8,142.

BOGO, Philippines, town situated on the east coast near the northern end of the island of Cebú, 56 miles north of Cebú. It has a good harbor and is connected by canal with the opposite shore of the island. Pop. 14,915.

BOGOMILES, a religious sect, said to have been pretty widely spread in Thrace and Bulgaria as early as the 10th century. They were persecuted by the Byzantine Emperor, Alexander Comnenos, and their leader, named Basil, was burned alive at Constantinople in 1118. The name of the sect is said to be composed of two Slavonic words, meaning «God, have mercy.» The Bogomiles believed that God had two sons, Satanael and Jesus or Logos. The former rebelled, and created the material world, and also man. God gave a soul to man, but he was left under the control of Satanael until the coming of the Logos. The law was given to Moses by Satanael, and is not recognized by the Bogomiles, who accept of the Old Testament only the Psalms and the Prophets. The Logos, or Christ, came down from heaven to deliver man from the power of Satanael. This sect, which held many extravagancies of doctrine, continued to exist for several centuries. They practised severe asceticism, rejected the sacraments, or put new interpretations on them, and made frequent prayers both by day and night. Despite the persecutions to which they were subjected the Bogomiles did not die out, and at the time of the Mohammedan conquest of Bosnia in the 15th century the greatest number of the Christians who embraced Islam belonged to the sect. Adherents of the sect are still to be found. Consult Heard, ‹The Russian Church and Russian Dissent› (New York 1887).

BOGOS, bō'gōz, a people of Abyssinia, occupying a district in the highlands north of Abyssinia, now part of the Italian colony of Eritria. The land is intersected by the broad and beautiful valley of the Anseba, and comprises on the west the elevated and hilly region as far as the sources of the Barca, and on the east the slopes of the plateau of Mensa. The climate and vegetation are similar to those of Abyssinia. The rainy season lasts from March to September, when the Anseba overflows its banks and fertilizes the valley through which it flows. There is a great variety both in the flora and the fauna of the country. Large baobab trees, sycamores and tamarinds overshadow the banks of the Anseba, which are rendered almost impassable by the number of Euphorbiæ and creeping plants. At the same time there are to be found rhinoceroses, elephants, wild boars, buffaloes, antelopes, lions, leopards, wildcats, jackals, wolves, etc., in great numbers. The population is only about 10,000, which is engaged in agriculture and the raising of cattle, and carries on a trade with the neighboring places in corn, butter, ivory, skins, buffalo-horns and ostrich-feathers. Their language, which is akin to the Agow, is called by themselves Bilin. Their countenance is Greek in its contour, their body light, powerful and well formed; the color of their skin dark olive-brown; their lips are thin, the cheek-bones not prominent and they have generally bushy whiskers. The patriarchal institutions of the Bogos are peculiar. The members of each union of families are pledged to apprehend any one of their number who is charged with the commission of a crime. The laws relating to dowries, inheritance and murder are regularly codified. The religion is the Christian, but Mohammedanism, which is increasing, has a considerable number of adherents.

BOGOSLOV, bō-gō-slōf', a small volcanic island of the Aleutian archipelago, lying northwest of Unalaska. It was formed in 1795–96 by a series of volcanic upheavals; on the site previously there had been low rocks and reefs. It is a favorite haunt of sea lions.

BOGOTÁ, bō-gō-tä', or **SANTA FÉ DE BOGOTÁ,** the capital of the Republic of Colombia. Despite the fact that it is but 4° 41' north of the equator, the elevation of the plateau on which it stands is so great (over 8,000 feet) that the breeze is cool and invigorating. But there are, Colombians admit, many damp days, and the rarefaction of the air is somewhat trying. A fertile plain or table-land of exquisite beauty extends for a distance of about 30 miles on three sides, while directly above rise two mountains of moderate height, and surrounding the whole scene are snow-capped peaks of the Andes — among them the extinct volcano of Tolima. Water is supplied by two mountain streams flowing through the town itself; the supply, however, is not kept free from contamination, and is insufficient for the present needs of the city. Unfortunately the overcrowding of buildings occupied by the poorer classes, and the absence of a good system of drainage, offset the conditions otherwise favorable to health. Bogotá is lighted by gas and electricity; its streets are well laid out; and the houses, though low, are substantially built. There is a valuable library of over 50,000 volumes; and the university, founded in 1867, is considered the best in the Andean region north of Peru. On 12 Sept. 1902 the government decreed the establishment of a museum and academy, to increase the popularity and efficiency of the National School of the Fine Arts. Founded in 1538 by Gonzalo Ximénes de Quesada, a native of Santa Fé, a small town near the city of Granada, and in the Spanish province of that name, Bogotá became the capital of New Granada, as the country was first called by the Spaniards. For history, industries, etc., see COLOMBIA. In the volume ‘Colombia,’ by Phanor J. Eder (London 1913), we read that students from all departments are attracted to the National University at the capital. “There are 536 students, 232 attending the Law School, 202 the Medical School, 58 the School of Mathematics and Engineering, and 44 the Dental School. Not more than 25 or 30 per cent, however, complete their studies, but the attendance is rapidly increasing: in 1906, for instance, there were only 77 students in the Law School.” Mr. Eder says that the Art School and the Conservatory of Music of Bogotá “do remarkably good work considering the scanty resources they command. The economic helplessness of the departments, coupled with the fact that the governors, prefects, and alcaldes are appointed mediately or immediately by the President, causes all power to be centralized at the national capital. The new presidential palace is of an unpretentious exterior; the interior is wholly charming, with a refreshing flower-filled court and fountain in the centre, the rooms bright, the offices possessing an air of dignity and quiet, constant activity.” Pop., according to last census, 123,000.

BOGUE, bōg, **David,** Scottish clergyman, the originator of the London Missionary Society: b. Hallydown, Berwickshire, 18 Feb. 1750; d. Brighton, 25 Oct. 1825. In 1771 he removed to London, and became minister of an Independent chapel at Gosport. In 1780 he became tutor to an establishment for directing the studies of young men destined for the ministry in the Independent communion. He now began the formation of a missionary scheme, which afterward resulted in the London Missionary Society and had intended, with some others, to engage in mission work in India, but the project was frustrated by the East India Company. The influence which the establishment of this institution had on the public mind was great, and the springing up of the British and Foreign Bible Society and the Religious Tract Society, at short intervals, proves how much good was effected by the impetus it imparted. In the establishment of both of these he took an active part, contributing to the latter body the first of a series of useful publications. In 1815 he received the degree of doctor of divinity from Yale College. His more important works are ‘An Essay on the Divine Authority of the New Testament’ (translated into many languages), ‘Discourses on the Millennium,’ and a ‘History of Dissenters’ which he undertook in conjunction with his pupil and friend, Dr. Bennet — a standard work. Consult Morison, ‘Fathers and Founders of the London Missionary Society’ (London 1846).

BOGUE, Virgil Gay, American engineer: b. Norfolk, N. Y., 20 July 1846; d. 14 Oct. 1916; graduated Rensselaer Polytechnic Institute; assistant engineer Prospect Park, Brooklyn, 1868, and for 10 years was in Peru on railway work. During 12 years' service with the Northern and Union Pacific companies, he discovered “Stampede Pass” across the Rocky Mountains in 1881. In 1905 while established as a consulting engineer in New York city, he became chief engineer and vice-president of the Western Pacific Railroad, and subsequently was consulted on improving the navigation of the Columbia River, on the harbor plans for Tacoma, Wash., and in the trans-insular railroad for South Island, New Zealand.

BOGUSLAWSKI, bō-goo-släviskẹ, **Adalbert,** Polish actor and dramatist: b. Glinna near Posen 1752; d. Warsaw, 23 July 1829. As composer of many original dramas of a national character he is looked upon as the founder of Polish drama, and he also translated plays and operas from the French, English and Italian. From 1778 to 1809 when he finally settled as manager of the theatre in Warsaw, he traveled through Poland acting and establishing theatres in various cities. His plays were published at Warsaw in nine volumes, 1820–25; his original works were collected in three volumes, 1849–54.

BOGUSLAWSKI, Palm Henri Louis von, German astronomer: b. Madgeburg, 7 Sept. 1789; d. Breslau, 5 June 1851. He was enrolled in the army for the campaign of 1806 and afterward studied astronomy. Called to Berlin in 1809, made lieutenant in 1811, he continued his astronomical studies under Bode, and through the latter was enabled to visit the principal observatories of Europe from 1812 to 1815. He was wounded at Culm, taken prisoner but escaped to Bohemia and joined his corps at Erfurt. He retired from military service after Waterloo and for many years his failing sight forced him to abandon his astronomical observations. In 1831 he was appointed curator of the Breslau observatory, became professor at the university there in 1836 and director of the observatory in 1843. On 20 April 1835 he discovered the comet known by his name. His principal work is ‘Uranus’ (3 vols., Glogau 1846–48).

BOHA-EDDIN, bo-hạ-ed′din, or **BOHADDIN,** Arabian scholar and historian: b. Mosul, 1145; d. 1235. Having attained proficiency in Moslem law, he became, at the age of 27, a lecturer at Bagdad. In 1186 he made the pilgrimage to Mecca, and while in Damascus on his return, he was appointed cadi of Jerusalem and of the Moslem army camp by Saladin, who was desirous of availing himself of the services and influence of so able a scholar, and a man of such reputed Moslem piety and zeal. He accordingly brought his learning and talent to the work of glorifying the wars of that ambitious monarch, in a treatise on the ‘Laws and Discipline of Sacred War.’ On the death of Saladin he transferred his attachment to the son, Malek-al-Dhaher, whom he was instrumental in establishing in the succession to the throne. He was appointed cadi of Aleppo, and there founded a college, at which he continued to give lectures until he was 90 years old. His great work was, however, the ‘Life of Saladin,’ which was published with a Latin translation at Leyden in 1732. Consult C. R. Conder's edition of the ‘Life of Saladin’ with notes by C. Wilson (London 1897).

BOHAN, Stone of. Erected in honor of Bohan the Reubenite. It was situated in the Valley of Achor between Beth Arabah and Debir. This stone afterward served as a boundary mark on the frontier of Judah and Benjamin (Joshua xv, 6; xviii, 17); but whether it was intended as a sepulchral monument or erected to commemorate some great exploit performed by this particular Bohan (for there were several of the same name) neither history nor tradition informs us.

BOHÈME, La. Grand opera in four acts by Giacomo Puccini (libretto by Giacosa and Illica, founded on a tale by Henri Murger) first produced at Turin, Italy, 1 Feb. 1896. It was the composer's fourth opera and at once placed him at the head of the younger Italian school and gave him an international reputation. The plot is constructed out of four slightly connected scenes, each complete in itself, presenting, in admirably contrasted light and shade, a vivid picture of the Latin Quarter of Paris of the period of 1830. The four inseparables, Rodolphe, Marcel, Schaunard and Colline, poet, painter, musician and philosopher, Mimi, the frail grisette, and Musette, frivolous, but kind-hearted child of pleasure, form an appealing group, and the composer has, with unquestioned genius, given them a human touch unusual on the operatic stage. The music is melodious in the true Italian sense. There is a fine sincerity in the reflection of the pathos, ever near the surface, even when the characters are at their gayest, and there is usually a satisfying psychological fitness between the melody and the underlying sentiment. The composer's command of his medium is nowhere better shown than in the second act, the scene of the Café Momus with its rapid motion, colorful ensembles and kaleidoscopic contrasts. The orchestra, in which modern influences are plainly felt, is handled skilfully throughout. Occasionally there are rude, uncontrolled outbursts of passion, hallmarks of the «verismo» school of which Mascagni's ‹Cavalleria Rusticana› is the type; but more generally the music is softened and refined under the influence of the later Verdi. The love scene in the first act, and even more, the duo in the last, contain moments of great lyric beauty, while there is dramatic intensity in the death scene and the brief succeeding orchestral finale. One of the most fluent numbers is Musette's Waltz Song in the second act.

Without any present indication of serious rivalry with Verdi, the greatest of the Italians, Puccini has, nevertheless, made a definite place for himself, not only with the general operatic public, but with the musically élite as well. ‹La Bohème› is one of the most popular operas in the repertory of European and American opera houses.

LEWIS M. ISAACS.

BOHEMIA, BÖHMEN (anciently BOHEIM), Czechoslovakia, a province formerly a kingdom bounded on the southwest by Bavaria, on the northwest by the state of Saxony, on the northeast by the province of Silesia and on the southeast by Moravia and the republic of Austria. It contains 20,065 square miles, and has about 6,850,000 inhabitants, of whom about three-fifths are Czechs, nearly 90,000 Jews and over 2,000,000 Germans. Under Austrian rule Bohemia sent 130 representatives, or one for each 52,000 inhabitants, to the lower house of Parliament. Its provincial diet consisted of 262 members. Bohemia is surrounded on all sides by mountains, possesses large forests and many small lakes or ponds. Its plains are remarkably fertile. The largest rivers are the Elbe and the Moldau. All sorts of grain, flax, hops (the best in Europe) and fruits are exported. Wine is not abundant, but in the neighborhood of Melnik is of pretty good quality. The raising of sheep, horses, swine and poultry is carried on to a considerable extent. The mines yield silver, copper, lead, tin, garnets and other precious stones, iron, cobalt, arsenic, uranium and tungsten, antimony, vitriol, alum, calamine, sulphur, plumbago and coal in abundance. There are also numerous mineral springs.

The industry of Bohemia, favored by its central situation, has long rendered it one of the most important states of Central Europe. Spinning and weaving are extensively carried on in the northern and southeastern districts; manufactures of lace, ribbons, metal and wood work, chemical products and other branches of skilled industry are also largely developed. Pottery, porcelain, glassware, cutting of precious stones, give employment to many hands. The glassware of Bohemia alone, which is known all over the world, employs 50,000 workers. Large quantities of beer (Pilsener) of the kind known as lager are exported. Prague, the capital, is the centre of the manufactures and of the commerce of the country. The largest towns are Prague, Pilsen, Reichenberg, Budweis, Teplitz, Aussig and Eger. For internal intercourse there are excellent highways, extending to 10,000 miles, and several important lines of railway leading both southeast to Vienna and northwest toward Dresden. The Bohemians of all ranks are distinguished for public spirit. Among the public establishments for education are a German and a Czech university at Prague, two technical high schools, four theological academies, many gymnasiums and over 5,000 schools. The prevailing religion is the Roman Catholic; other sects, however, are tolerated. The language of the country is Bohemian, a dialect of the Slavonic; in some districts, and in most of the cities, German is spoken. See BOHEMIAN LANGUAGE AND LITERATURE.

History.— Bohemia received its name from a tribe of Gallic origin, the Boii, who were expelled by the Marcomans at the commencement of the Christian era; the latter were in turn obliged to give place to the Germans, and these to the Czechs, a Slavonic people who had established themselves in Bohemia by the middle of the 5th century. The country was at first divided into numerous principalities, which were temporarily united into a monarchy in 627 under Samo, but the work of this prince did not survive him. Charlemagne attempted the conquest of Bohemia without permanent result, although he succeeded in rendering it tributary; and the Emperor Louis had his army nearly destroyed by the Bohemians in 849. Christianity was introduced into Bohemia in the reign of Borzwog I (894–902), a descendant of Přzemysl, whose family held sway in Bohemia for about six centuries (722–1306). In 1092 Bohemia was finally recognized as a kingdom under Wratislas

II. Up to 1230 the monarchy was elective and then became hereditary; the right of election, however, was suspended, not abrogated. The monarchs received investiture from the German Emperor, held one of the great offices in the imperial court, and were recognized as among the seven electors of the empire. Separated from Germany, however, by a rampart of mountains, by origin, language and national customs, the Bohemians kept aloof from the general politics of the empire, and their kings frequently received dispensations from attending the Diet. The peasantry were in a state of villenage, but there was a numerous and powerful nobility, the Diet assembled frequently and the nobles came armed to defend their rights. The royal authority was limited by the coronation oath. Bohemia was frequently at war with Poland, the Emperor or some of the surrounding states; it was successively united and disunited with Hungary, Silesia, Moravia, etc., according to the course of wars and alliances. Ottokar II (1253–78) had extended his conquests almost from the Adriatic to the Baltic, when he lost them and his life in contest with Rudolph, the founder of the too successful house of Hapsburg. His grandson Wenceslas III was assassinated at Olmütz, and with him closed the dynasty of Přzemysl. The house of Luxemburg succeeded in 1310, and governed Bohemia till 1437. Under Charles IV (1346–78), who also held the sceptre of the German empire, Bohemia prospered, and advanced in civilization and science. Toward the close of this second dynasty civil wars were excited by the promulgation of the doctrines of Huss and the persecution of his followers. These wars were protracted by the genius of John Ziska, the leader of the Hussites, a man who, although latterly quite blind, has for military genius been compared to Hannibal. Ziska was rarely defeated, and his success inspired the utmost enthusiasm in his followers. He has been called the inventor of the modern art of fortification, and by his skill in this art he made Mount Tabor an impregnable fortress. After the death of Ziska the moderate party of the Hussites, who were called Calixtines, from their insisting on the retention of the sacramental cup for the laity, united with the Roman Catholics, and Sigismund was acknowledged king in 1433. The conditions of this compact being ill observed, George Podiebrad, a nobleman of the reformed party, was by them elected king in 1458. On his death in 1471 they chose Wladislas, son of Cassimir, King of Poland, who also obtained the crown of Hungary. His son Louis lost both crowns with his life in the battle of Mohács against the Turks, and Ferdinand of Austria became, in 1527, sovereign of both kingdoms. Bohemia later lost its separate existence, becoming (1620) hereditary in the house of Austria. Its subsequent history to 1918 pertains to that of the Austrian empire. It was desolated by the Thirty Years' War, and it suffered severely from religious persecutions, by which, indeed, the Reformed faith was almost entirely suppressed in it. The Emperor Joseph II gave some protection to the Protestants. In 1848, when Europe was convulsed with revolutionary movements, a momentary attempt was made to assert the ancient independence of Bohemia against the Austrian dominion; a conflict took place between the army and the people, Prague was bombarded and the insurrection suppressed. From 1848 to 1918 there was a constant struggle for ascendency between the Slavonic Czechs and the Germans. On the fall of the Dual Monarchy in 1918, as a result of the war, Bohemia, with Moravia, Silesia, Ruthenia and adjoining small territories united in forming the Republic of Czechoslovakia.

Charles Leonard-Stuart,
Editorial Staff of The Americana.

BOHEMIAN BRETHREN. A Christian sect which arose in Bohemia about the middle of the 15th century from the remains of the Hussites. Dissatisfied with the advances toward the Catholic Church by which the Calixtines had made themselves the ruling party in Bohemia, they refused to receive the compacts, as they were called, that is, the articles of agreement between that party and the council at Basel (1433), and began about 1457, under the direction of a clergyman, Michael Bradatz, to form themselves into separate parishes, to hold meetings of their own and to distinguish themselves from the rest of the Hussites by the name of Brothers, or Brothers' Union. Amidst the hardships and oppressions which they suffered from the Calixtines and the Catholics without making any resistance, their numbers increased so much, through their constancy in their belief and the purity of their morals, that in 1500 their parishes amounted to 200, most of which had chapels belonging to them. They rejected the idea of transubstantiation, admitted only a mystical spiritual presence of Christ in the eucharist, and took the Scriptures as their sole doctrinal guide, and for this latter, but more especially for the constitution and discipline of their churches, received the approbation of the reformers of the 16th century. They aimed at restoring the primitive purity of Christianity by the exclusion of the vicious from their communion, and their distribution of the members of their society into three classes — the beginners, the proficients and the perfect. Their strict system of superintendence, extending even to the minute details of domestic life, did much toward promoting this object. To carry on their system they had a multitude of officers of different degrees; ordaining bishops, seniors and conseniors, presbyters or preachers, deacons, ædiles and acolytes, among whom the management of the ecclesiastical, moral and civil affairs of the community was distributed. Their first bishop received his ordination from a Waldensian bishop, though their churches held no communion with the Waldenses in Bohemia. They were destined, however, to experience a like fate with that oppressed sect. When, in conformity with their principle of not performing military service, they refused to take up arms in the Smalkaldic War, Ferdinand took their churches from them, and in 1548, 1,000 of their Society retired into Poland and Prussia, where they first settled in Marienwerder. The agreement which they concluded at Sendomir (14 April 1570) with the Polish Lutherans and Calvinistic churches, and still more the Dissenters' Peace Act of the Polish Convention (1572), obtained toleration for them in Poland, where they united more closely with the Calvinists under the persecutions of the Swedish Sigismund, and have continued in this connection to the present day.

Their brethren who remained in Moravia and Bohemia recovered a certain degree of liberty under Maximilian II, and had their chief residence at Fulneck in Moravia, whence they have been known as the Moravian Brethren. The issue of the Thirty Years' War, which terminated so unfortunately for the Protestants, occasioned the entire destruction of their churches, and their last bishop, Comenius, who had rendered important services in the education of youth, was compelled to flee. From this time they made frequent migrations, the most important of which took place in 1722, and occasioned the establishment in Saxony of the new churches of the Brethren by Count Zinzendorf (q.v.). Although the old Bohemian Brethren must be regarded as now extinct, this Society will ever deserve remembrance, as a quiet guardian of Christian truth and piety, in times just emerging from the barbarity of the Middle Ages; as a promoter of pure morals, such as the reformers of the 16th century were unable to establish in their churches; and as the parent of the esteemed and widely extended association of the United Brethren, whose constitution has been modeled after theirs. See United Brethren.

BOHEMIAN FOREST (Böhmerwald), a mountain range or ridge of central Europe, extending from the Fichtelgebirge southward toward the confluence of the Ilz and the Danube, and separating Bavaria from Bohemia. Area about 4,400 square miles. The Bohemian forest in ancient times formed a part of the Silva Hercynia, the highest peaks being the Arber (4,840 feet high) and Rachel. The great abundance of wood has occasioned the establishment of many glass houses, forges, etc., in this region. The inhabitants have acquired in their seclusion from the world many characteristic virtues and vices.

BOHEMIAN GIRL, The. Grand opera in three acts by Michael W. Balfe (libretto adopted by Alfred Bunn). First produced at the Drury Lane Theatre, London, on 27 Nov. 1843. An Irishman by birth, Balfe followed Italian models in his music, influenced, no doubt, by Rossini, whom he knew. He wrote a large number of operas which had great vogue for a time, but only 'The Bohemian Girl' survives. It was easily the most successful of his works and was quickly translated into French, Italian and German. It was first produced in America within a year of its premiere and duplicated its European success. In his younger days, Balfe was prominent and successful as a singer and therefore knew well from personal experience how to meet the vocal requirements of the popular operatic performer. His music is tuneful, but insipid, and not of the sort that wears well. Nevertheless, he had the gift of melody, well illustrated in such ballads as «I dreamed I dwelt in marble halls,» «When other lips and other hearts,» «The heart bowed down,» which abound in 'The Bohemian Girl' and which have a certain persistent appeal in spite of — or, possibly, because of — the sentimenal words provided by the librettist.

Lewis M. Isaacs.

BOHEMIAN LANGUAGE AND LITERATURE. The language of Bohemia, otherwise called Czech, is one of the Slavonic group of the Aryan or Indo-European family of tongues, and accordingly allied to Polish, Russian, Serbian, Bulgarian, etc. (See Slavs or Slavonians). The Czech (Bohemian) language or dialect was the first of the Slavonic idioms which was cultivated scientifically. It is spoken in Bohemia, Moravia, with slight variations in Austrian Silesia, in Hungary and in Slavonia. Three chief dialects of this language are recognized, namely, the Bohemian or Czech proper, the Moravian of Moravia and Silesia and the Slovak of Hungary. The Bohemian alphabet consists of 42 letters, expressing a great variety of sounds. The English sound of *ts* the Bohemian expresses with *c*, the English *y* with *g*, the *sh* with *ss* or *s*, the Italian *ce* or *ci* with *c* modified, the French *ge* and *gi* with *z*, the Italian *u* with *y*, the *gn* with *n*, the English *w* with *w*, particularly at the end of words. The sound of entire words, not that of the single letters which compose them, determines the roughness or smoothness of their pronunciation. The terminations of the various declensions and conjugations are mostly vowels, or the smoother consonants. In general, the Bohemian has a natural melody like that of the Greek.

The Bohemian language, moreover, has much expressiveness and energy, as it is not weakened by a number of articles, auxiliary words, conjunctions and words of transition, but is able to represent the objects of imagination, of passion and all the higher emotions of the poet and orator, in a lively manner; by its brevity, heaping together the most significant words, and arranging the connection of the parts of speech according to the degree of feeling to be expressed, so as to give the style, spirit and energy, or gentleness and equability. Like various other tongues, it designates many objects by imitation of natural sounds. Thus the name of many animals are taken from their voices, as *kruta,* the turkey; *kachna,* the duck. Many plants are named from their effects, as *bolehlaw,* hemlock (from headache). The conciseness of the language is increased by the absence of auxiliaries in the greater part of the verbs. The preterites, in the third person singular and plural, express a meaning still further condensed, as the variation in the last syllable is made to designate the sex; for example, *psal, psala, psalo,* he, she, it, has written; *psali, psaly, psala,* they have written. In like manner the Bohemian saves many prepositions and much circumlocution of other kinds, by the use of the *instrumental,* agreeing with the Latin ablative; for instance, *secenjm mece hlawu mu st' al* (*t* read like *te*), «with a blow of the sword he has cut off his head.» This language is, therefore, very well fitted for the translation of the Latin classics. By the use of the past participle active the Bohemian can designate, as well as the Greek, who has really performed the action contained in the predicate of the accessory clause, which the Latin, with its ablative absolute or participle passive, must leave always undefined and dubious. The same kinds of actions performed with different implements are often expressed by peculiar words; for example, the verbs *zjti, strjhati, krágeti, rezati,* denote to cut with the scissors, with the sickle, with the knife and with the scythe. In the subtlety of grammatical structure the Bohemian is like the Greek, and has the advantage over the Latin and other languages. In speaking of two hands, two eyes, etc., the dual number is used; for example, *ruce, oci,* etc. The language is also capable of expressing the idea of duration, referring to an indefinite past time, like the Greek aorist; for instance, *kupowal dum, ale nekaupil ho,* he was engaged in buying the house, and did not buy it. The language affords several preterite tenses, distinguished with great subtlety, as *kaupil,* he has bought once; *kupowal,* he had purchased for a long time; *kupowáwal,* he had purchased formerly several times; *kupowáwáwal,* he seldom had purchased in former times; moreover, by adding the auxiliary verb *byl,* a time still longer passed may be expressed, though this is very seldom used; for instance, *byl kupowáwal,* he had purchased in times long past. Another advantage of the language consists in the various future tenses by which the Bohemian denotes not only the time but also the duration, and the more or less frequent repetition of the action; for instance, *kaupjm,* I shall purchase once; *budu kupowati,* I shall be purchasing for a long time; *budu kupowáwati,* I shall purchase several times; and *budu kupowáwati,* I shall be purchasing very often. Not less manifold in signification, and equally subtle in the determination of time, are the participles and the participial constructions. The determination of sex and number by the final syllable of the participle gives the Czech language no small advantage over others. Small connective particles of speech the Bohemian has in common with the Greek. The Greek *alla, men, gar, de, te,* etc., agree with the Bohemian *ele, pak, wsak, li, z, t';* only the three latter are always affixed to a word. Finally, the free, unrestrained arrangement of the words contributes much to perspicuity, as the Bohemian is less fettered than almost any other modern language to a particular order.

Bohemian Literature has been divided historically into five periods. The first extends from mythological times to 1409. It affords no written documents of remote antiquity. We know, however, that the language at an early period was similar to the present from the names of the gods, dukes, rivers, cities and mountains which have been preserved, such as Perun, Přzemysl, Borzwog, Wltawa, Bila, Praha, Tetin. The Slavonian apostle Method, and the philosopher Constantine, called *Cyril,* made the Slavonians in Moravia acquainted with Christianity. Thence it penetrated to Bohemia, and thus the people of this country received the Græco-Slavonic ritual in the year 845. The same Constantine invented for the sounds of the Slavonic language the Cyrillo-Slavonic alphabet, borrowed mostly from the Greek. In later times the Glagolitic alphabet sprang up, of which, however, less use was made. When the Latin Church supplanted the Greek in Moravia and Bohemia the Latin alphabet came also into use instead of the Cyrillic. In Bohemia the Cyrillic character remained in use only with the monks of Sazawa, who observed the Slavonic ritual. As the Latins endeavored to annihilate all the writings of the old ritual, and the Slavonic language was, in many cases, obliged to give way to the Latin, Bohemian literature suffered incalculable injury; hence we possess from the earlier centuries but a few insignificant remains in the characters above mentioned. In the 10th century the Bohemians had a school at Kudet, in which they learned Latin. Their most ancient relic is the hymn (Hospodine Pomiluyny) of Bishop Adalbert (Wegtech), a native Bohemian, sung to the present day even by the Russians and Poles. The Bohemians possess some remains of a collection of lyrico-epic national songs, without rhyme, which seem to have been of great merit. The manuscript appears to have been written in 1290 and 1310. Goethe found these national songs worthy of particular attention. Under the Emperor Charles IV, who promoted the cultivation of the Bohemian language, the University of Prague was founded in 1348. In the Golden Bull he commanded the sons of the German electors to learn the Bohemian language. Under his son, the Emperor Wenceslas, all decrees were written in Bohemian, which formerly were in Latin. Prague was then not only the most populous city in this part of Europe, but also, on account of its splendid court and the wealth of its citizens, the centre of the arts and sciences. Almost all the intellectual currents of the West found entrance into Bohemia, and German literature in particular had a powerful influence. The heroes of the Alexandrian and Arthurian cycles of romance became familiar to the Czechs in their own language. Dalimil Mezericky wrote a history of Bohemia in verse; Ondreg Z. Dube, a collection of Bohemian laws, in three volumes; Warinec Z. Brezowa, a history of the Roman emperors, and translated Mandeville's 'Travels'; and Pribik Pulkawa, a Bohemian history. This period affords also many vocabularies, poems, songs and translations.

With Huss began the second period, from 1409 to 1500. The prevalence of religious disputes caused the Bible to be generally read and understood. Huss of Hussinetz translated Wickliffe's book, 'Trialogus,' into the Bohemian tongue, and sent it to the laymen as presents. The 'Treatise of the Six Errors' he caused to be inscribed in Bohemian on the walls of the chapel of Bethlehem. He wrote his first collection of sermons when at the castle of Kozy (1413), besides an 'Appeal to the Pope,' 'Commentary on the Ten Commandments,' an 'Explanation of the Twelve Articles,' two sermons on the Antichrist; the 'Triple Cord,' and several excellent hymns. His letters from the dungeon in Constance to the Bohemians were translated by Luther into Latin, accompanied with a preface, and printed at Wittenberg in 1536. He and Jakobellus and Jerome improved and distributed the Bohemian Bible, of which several copies have been preserved to our times. Of Ziska of Trocnow, one of the greatest generals in history, several letters and his rules of war have been preserved. From this period have come down to us several war songs of the Taborites, also some songs of Prague. Martin Lupac undertook, with the assistance of some learned men, the labor of retranslating the whole New Testament. The church service was now performed entirely in the Bohemian language. Mladienowic, an eye-witness of the execution of Huss, wrote an account of his life. This used to be read in the Bohemian churches. Procopius continued the rhyming chronicles of Dalimil. Lodkowic related his 'Journey to the Holy Sepulchre,' Sasek of Mezyhor wrote

‘Notes and Travels Through Germany, England, France, Spain, Portugal and Italy of the Bohemian Baron Loew of Rozmital and Vlatna’ (whom he accompanied), a contribution to our knowledge of the manners of the 15th century, published in a German translation at Brunn (1824). M. Gallus, Albjk, Chrislan, Zidek, J. Cerny, J. Blowic and Sindel wrote on medicine, astrology and agriculture. As early as 1447 we have an anonymous work on the grafting of trees. We have also the rhyming legend of the 10,000 knights, a translation of the fables of Æsop, the council of the beasts and the birds, in prose and verse, in three volumes (Placj Rada). Each lesson, which flows in rhyme from the mouths of the animals, is preceded by the natural history of the animals and the moral. It was printed three times in the Bohemian language, and published at Cracow in Latin verse (1521, 4to). Of the Bible 14 translations have come down to us, besides 10 of the New Testament. The oldest, of the year 1400, is in Dresden. The typographic art made a rapid progress in Bohemia. The first printed work was the Epistle of Huss from Constance, in 1459; the second, ‘The Trojan War,’ in 1468; the third, a ‘New Testament,’ in 1474; the whole Bible, in 1488; the first almanac, in 1489.

The third age, from 1500 to 1620, may be called the golden age of the Bohemian language. The cultivation of learning — in other countries, with only a few exceptions, the monopoly of the clergy— was in this favored land open to the whole nation. All branches of science were elaborated, and brought to an uncommonly high degree of improvement for that time. Gregory Hruby of Geleni translated the work of Petrarch ‘De Remediis utriusque Fortunæ.’ W. Pisecky translated from the Greek the ‘Exhortation of Isocrates to Demonikos.’ John Amos Comenius wrote 54 works, some of which were very excellent. He published his ‘Janua’ and an ‘Orbis Pictus,’ which, translated in his lifetime into 11 languages, have passed through innumerable editions. In all the north of Europe Comenius attracted attention by his projects for improving education, which were deliberated upon even by the Diet of Sweden and the Parliament of England. The hymns of this and the earlier ages, part of which have been translated by Luther, may serve as standards for all languages. In Prague alone there were at this period 18 printing presses, in the country towns of Bohemia 7; and in Moravia also 7; many Bohemian books, too, were printed in foreign countries, as in Venice, Nüremberg, Holland, Poland, Dresden, Wittenberg and Leipzig.

The fourth period begins with 1620 and ends with 1774. After the battle at the White Mountain, the whole Bohemian nation submitted entirely to the conqueror. The population of most of the cities and of whole districts migrated in order not to be false to their faith. More than 70,000 men, and almost the whole of the nobility, all the Protestant clergy, scholars and artists, in general the most cultivated part of the nation, left their native country. Of these emigrants the greater part formed the flower of the army of Count Mansfield. Hence the Thirty Years' War depopulated Bohemia more than any other country, since these fugitives endeavored to regain their native country by repeated invasions. The fugitives established at Amsterdam, Dresden, Berlin, Breslau and Halle printing presses, and sent to their brethren in Bohemia, Moravia and Hungary a number of books, mostly new editions. Some Bohemians who observed the decay of their language strove to remedy it; as Pesina Z. Cechorodu; Joh. Beckowsky, who continued the Bohemian history to 1620; W. Weseley, who wrote a work on geometry and trigonometry, etc.; but the decay was too great to admit of being checked; the nobility had become strangers, and the government encouraged only German literature. From this time, therefore, the Bohemians wrote more in the German language.

In the fifth period, from 1774 to the present time, a new ray of hope shone on Bohemian literature, when, under the Emperor Joseph II, a deputation of secret Bohemian Protestants, trusting to his liberal views, made him acquainted with the great number of their brethren of the same faith. He perceived the necessity of introducing toleration, and hundreds of thousands of Protestants in Bohemia and Moravia came to light: their concealed works were printed anew, their classical language was again acknowledged and cultivated. Under this protection many men of merit, mindful of the fame of their ancestors, endeavored to cultivate anew all branches of the sciences, and to rival, if possible, the results attained by their more advanced neighbors. From about the year 1820 great activity was manifested by the Bohemian writers in the various departments of literature. A little before this Milton's ‘Paradise Lost’ was translated into Bohemian, and subsequently Shakespeare's dramas, or most of them, were likewise translated, the native drama being also cultivated. Kollar and Chelakovsky distinguished themselves in poetry, and perhaps even more Hynek Macha, whose poem “May” is said to still maintain an influence over Bohemian poetry. Kollar and Chelakovsky were advocates of the Panslavic movement. The chief work of the former was ‘Slava's Daughter,’ a long lyrico-epic poem. Several writers became well known as novelists, some of them following the lead of Sir Walter Scott. Jungmann (the translator of Milton) brought out a valuable ‘History of Czech Literature,’ and Schafarik his ‘History of the Slavonic Language and Literature’ and his ‘Slavonic Antiquities.’ Among more recent poets of note may be mentioned the names of Halek Heyduk and Neruda, but it must be admitted that few Bohemian writers have become generally known, even by name, to the European reading public.

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BOHEMOND I, the son of the Norman adventurer Robert Guiscard, who rose to be Duke of Apulia and Calabria; b. 1056; d. 1111. He became familiar with warfare when a mere boy, took a prominent part in various expeditions to Greece and Illyria against Alexis Comnenus, and repeatedly defeated his troops with a very inferior force. As eldest son Bohemond naturally expected to succeed his father, but when the succession opened in 1085 Bohemond was absent in Greece, and his younger brother Roger, having obtained possession of the paternal inheritance, declared his determination to maintain it. A war between the brothers was followed by an arrangement which gave Bohemond nothing more than the principality of Tarentum. While assisting his brother at the siege of Amalfi he resolved to become a Crusader, and without waiting to complete it he harangued the troops so effectually on the glory to be gained in the Holy Land that the great body of them at once joined his standard. Bohemond was soon on his march, and after encountering considerable difficulties reached the scene of action. The Crusaders had laid siege to Antioch, but had made little progress and were beginning to despair of success, when Bohemond found means to gain over an Armenian renegade, who undertook to introduce him and his men by night, and that give them possession of the town. Bohemond laid the matter before his fellow-chiefs, and in doing so stipulated that in the event of success he himself should be Prince of Antioch. The Armenian kept his promise, and accordingly in 1098 Bohemond was installed in his sovereignty, which he retained ever after, and at his death transmitted it to his son, who assumed the title of Bohemond II.

BÖHLAU, bė′low, **Helene,** German novelist: b. Weimar, 22 Nov. 1859. She traveled much in the East, married Omar al-Raschid Bey at Constantinople and settled down in Munich. In 1888 her pictures of Weimar (Ratsmädelgeschichten) brought her a large measure of fame. She shows now and then a leaning toward the Romantic school, but on the whole her high power of description is realistic and her writings are imbued with passion. Among her works are ‘Novellen’ (1882); ‘Es hat nicht Sein Sollen’ (1891); ‘Das Recht der Mutter’ (1896; new ed., 1903); ‘Neue Ratsmädel- und Weimarische Geschichten’ (1897); ‘Halbtier’ (1899); ‘Sommerbuch’ (1902); ‘Die Kristallkugel’ (1903); ‘Isebies’ (1911).

BOHLEN, Peter von, German Orientalist: b. Wüppels, Oldenburg, 9 March 1796; d. Halle, 6 Feb. 1840. He spent the first 20 years of his life in straitened circumstances, but his talents and perseverance attracted attention, and he obtained admission to the Hamburg gymnasium. He afterward studied the Eastern languages at Halle and Bonn; and he obtained an appointment at Königsberg, first in 1825 as extraordinary, and afterward in 1830 as ordinary professor of Oriental literature. Bohlen has left many works which fully support his title to the high place which he held among Oriental scholars. One of the most important is a work entitled ‘Das alte Indien’ (2 vols., 1830–31), not yet superseded by any other work on the same subject. Other publications of his are ‘Die Genesis historisch-kritisch erläutert’ (1835) and editions of Bhartrihari's ‘Sententiæ’ (1833) and Kalidasa's ‘Ritusanhara’ (1840). The details of his life are given with great minuteness and honesty in an ‘Autobiography’ (Königsberg 1841), which is full of interest, and cannot be read without producing a full conviction that he was no less distinguished by his amiability in private life than by his literary acquirements.

BÖHM, Theobald, Bavarian musician: b. Munich, 9 April 1798; d. there 25 Nov. 1881. He was first flutist of the Munich Royal Orchestra for several years but is best known for his improvements in the construction and fingering of the flute. He wrote ‘Ueber den Flötenbau und die neuesten Verbesserungen desselben’ (1847) and ‘Die Flöte und das Flötenspiel.’ Consult Welch, ‘History of the Boehm Flute’ (London 1883).

BÖHM (bėm) **BAWERK, Eugen von,** Austrian economist and statesman: b. Brünn, 12 Feb. 1851. He studied law in Vienna and political economy and social science at the universities of Heidelberg, Leipzig and Jena. In 1880 he became privatdocent in the University of Vienna, later assistant professor at Innsbrück and professor there in 1884. He was next chief of department in the Ministry of Finance and in 1895 became Minister. In 1897 he was Ambassador at the German court and in 1904 became, for the second time, Minister of Finance. In 1899 he was elevated to the Upper Chamber; in 1907 became vice-president and in 1911 president of the Academy of Science. He is honorary professor of political economy in the University of Vienna. Böhm-Bawerk's greatest influence has been wielded in the field of economics to which he has contributed many works of the greatest merit, which have raised discussion to a high level and have been a constant and powerful stimulus to investigation in this important field. His ‘Geschichte und Kritik der Kapitalzins-Theorien,’ was a notable contribution to the critical literature of economic science. It was made available for English students in 1890 by Prof. William Smart of Glasgow. In the United States it has had a great vogue. Abundant proofs of Böhm-Bawerk's influence are furnished by our literature. A glance at the files of the *Political Science Quarterly*, the *Quarterly Journal of Economics* and the *Annals* indicates that a large proportion of the articles treating of economic theory are either directly upon some phase of Böhm-Bawerk's work or theories, or have been clearly influenced, if not directly inspired, by them. He is a proponent of the separate existence of the abstinence and the use theories of capital and interest and opposes the theory of productivity. His works include, in addition to the work mentioned above, ‘Karl Marx and the Close of His System’ (a criticism, London 1898); ‘The Positive Theory of Capital and its Critics’ (in *Quarterly Journal of*

Economics, April 1895); ‹Recent Literature on Interest, 1884–1899› (Eng. trans. by W. A. Scott, New York 1903).

BÖHME, bė'mė, or **BÖHM, Jakob,** one of the most renowned mystics of modern times: b. 1575, Altseidenberg, a village in upper Lusatia; d. Görlitz, November 1624. Böhme, being the son of poor peasants, remained to his 10th year without instruction, and employed in tending cattle. Raised by contemplation above his circumstances, and undisturbed by exterior influences, a strong sense of the spiritual, particularly of the mysterious, was awakened in him, and he saw in all the workings of nature upon his mind a revelation of God, and even imagined himself favored by divine inspirations. He became afterward a shoemaker; and this sedentary life seems to have strengthened his contemplative habits. In 1594 Böhme became a master shoemaker in Görlitz, married, and continued a shoemaker during his life, but withdrew himself more and more from the world. If we take into view his retirement, his piety, his rich and lively imagination, his imperfect education, his philosophical desire for truth, together with his abundance of ideas, and his delusion in considering many of those ideas as immediate communications of the Deity, we have the sources of his doctrine and his works. His first work, ‹Aurora, oder die Morgenröte,› was written in 1616, and contains his revelations on God, man and nature. This gave rise to a prosecution against him; but he was acquitted, and called upon from all sides to continue writing. One of his most important works is ‹Description of the Three Principles of the Divine Being.› His works contain profound and lofty ideas, mingled with many absurd and confused notions, but the basis of his thought is the theory that everything exists and becomes intelligible only through its opposite. The first collection of his writings was made in Holland in 1675 by Henry Betke; a more complete one in 1682 by Gichtel (10 vols., Amsterdam), from whom the followers of Böhme, a religious sect highly valued for their silent, virtuous and benevolent life, have received the name Gichtelians. Another edition appeared in Amsterdam in 1730 under the title ‹Theosophia Revelata› (2 vols.); the most complete in six volumes. In England, also, Böhme's writings have found many admirers. William Law published an English translation of them, two volumes. A sect, taking their name from Böhme, was likewise formed in England, and in 1697 Jane Lead, an enthusiastic admirer of his, established a particular society for the explanation of his writings, under the name of the Philadelphists. In very recent years his views have taken on fresh importance, his fundamental principle having been perceived as akin to that underlying the philosophical systems of Spinoza, Schelling and Hegel. Consult Hartmann, ‹Life and Doctrines of Böhme› (1893).

BOHN, bōn, **Henry George,** English publisher, of German parentage: b. London, 4 Jan. 1796; d. Twickenham, 22 Aug. 1884. On completing his education he worked for a time under his father, but about 1831 started business on his own account as a second-hand bookseller, and in 1846 began the issue of his famous libraries, the first of a solid and instructive kind published in England at a popular price. The first of these was the Standard, succeeded in the following year by the Scientific and the Antiquarian, in 1848 by the Classical, and from then till 1853 by the Illustrated, the Shilling, the Ecclesiastical, the Philological and the British Classics libraries. The whole number of volumes contained in these series exceeded 600. In 1864 and subsequent years he sold all his copyrights and other business properties, thus realizing a sum of nearly $500,000. Among his own works were ‹The Origin and Progress of Printing› (1857); ‹Biography and Bibliography of Shakespeare› (1863); ‹Dictionary of Quotations› (1867): ‹Handbook of Proverbs›; ‹Handbook of Games›; ‹Guide to the Knowledge of Pottery and Porcelain›; and editions of Lownde's ‹Bibliographer's Manual› and Addison's Works.

BOHOL, Philippines, an island belonging to the Visayas or Bisayas group. It has an area of about 1,511 square miles and an estimated population (1903) of 243,148. The interior is mountainous; Mount Copton, in the northeast, reaches 10,150 feet. Sugar-cane, rice, coffee and tobacco are grown and the island is reputed rich in gold deposits. The numerous rivers dry up after the rainy season. The most important town is Tagbilaran (pop. 12,000), a port on the southwest coast. The Visayas dialect prevails throughout Bohol.

BOHOR, an East African antelope (*Cervicapra bohar*), one of the larger reitboks. It ranges in East Africa from Abyssinia to Rhodesia. See REITBOK.

BÖHTLINGK, bėt'lĭnk, **Otto von,** Russian Sanskrit scholar: b. Saint Petersburg, 30 May 1815; d. 1 April 1904. He received his education in his native city, and in 1853 removed to Germany. In 1842 he returned to Saint Petersburg, but subsequently lived much in Jena and Leipzig. His chief work is a Sanskrit-German dictionary in seven volumes, prepared in conjunction with Professor Roth of Tübingen (1853–75). In 1879–89 he issued a smaller edition giving the meanings (with considerable additions), but omitting the quotations.

BOIAR. See BOYAR.

BOIARDO, bō-yär'dō, **Matteo Maria** (COUNT OF SCANDIANO), Italian poet: b. near Ferrara 1434; d. Reggio di Modena, 1494. From 1488 to 1494 he was commander of the city and castle of Reggio, in the service of his protector, Ercole d'Este, Duke of Modena. This accomplished courtier, scholar and knight was particularly distinguished as a poet. His ‹Orlando Innamorato› (1495) is continued to the 79th canto, but was incomplete. He immortalized the names of his own peasants and the charms of the scenery at Scandiano in the persons of his heroes and his descriptions of the beauties of nature. And the spirit of chivalry is happily wedded with the spirit of the Renaissance. In language and versification he has been since surpassed by Ariosto, whom he equaled in invention, grace and the skilful conduct of complicated episodes. Domenichi, Berni and Agostini new-modeled and continued the work of Boiardo without improving it. One continuation only will never be forgotten — the ‹Orlando› of Ariosto. In some of his works Boiardo was led by the spirit of his times to a close imitation of the ancients — for example, in his ‹Capitoli›; also in a comedy borrowed from Lucian's ‹Timon›; and in his Latin eclogues and translations of Herodotus and Apuleius. In his sonnets and *canzoni* (first printed at Reggio, 1499) he displayed great talents as a lyric poet. English translations have been made by Toft (1589), and Rose (1823). See ORLANDO INNAMORATO.

BOIDÆ, a family of serpents embracing two subfamilies: (1) the *Pythoninæ* (pythons), and (2) *Boinæ* (boas). This family contains the largest snakes of modern times, besides some species of small size; and is characterized especially by possessing vestiges of hinder limbs, appearing externally in the larger species as claw-like spurs on each side of the vent. The scales of the upper surface are small and smooth, while those of the belly (crawling scales) are narrower than in other serpents of similar size. The head is covered with enlarged flat scales or «shields,» especially in the pythons. The eyes are small and the pupils usually elliptical. The mouth is filled with strong recurved teeth borne on both the jawbones and on those of the palate. The body is thick and very muscular.

The subfamily *Pythoninæ* (pythons, carpet-snakes, etc.) have a pair of supraorbital bones, the premaxillaries carry teeth and the subcaudal scales are mostly in two rows. They number about 20 species, and belong to the tropical parts of the Old World, with a single species in Mexico (see PYTHON). They reproduce by laying eggs which are brooded until the young hatch.

The *Boinæ* lack the supraorbitals, have no teeth on the premaxillaries and a single row of subcaudal scales. They number 40 or more species, mostly American, but a few genera are to be found in scattered parts of the Old World tropics and in Madagascar, that island having two genera otherwise known only in America. The extraordinary distribution of this subfamily is one of the most interesting facts in zoogeography. The young in this subfamily are born alive, not from eggs as in the pythons. (See BOAS). Consult Boulenger, ‹Reptiles and Batrachians› (London 1914); Gadow, ‹Reptiles› (London 1901); Ditmars, ‹Reptiles of the World› (New York 1910); Gosse, ‹A Naturalist's Sojourn in Jamaica› (London 1851); Moles and Ulrich, ‹Serpents of Trinidad› (in ‹Proceedings› Zool. Soc. of London, pp. 499 et seq., 1894).

ERNEST INGERSOLL.

BOIELDIEU, bwäl-dyė, **François Adrien**, French composer: b. Rouen, 15 Dec. 1775; d. Grosbois, 8 Oct. 1834. He early displayed great musical talent, and at 18 wrote an opera, ‹La fille coupable,› which was performed with great applause. In 1795 he went to Paris, and rose rapidly in reputation, producing several operas and various other pieces which have become classical such as ‹Les deux lettres›; ‹La famille Luisse›; ‹Calife de Bagdad›; and ‹Ma tante Aurore.› When the Conservatoire de Musique was established he was nominated a professor. In 1803 he went to Russia as *maître de chapelle* to the Emperor Alexander, but returned to Paris in 1811, and subsequently composed ‹Jean de Paris› (1812); ‹Le chaperon rouge› (1818); ‹La dame blanche,› his masterpiece (1825); ‹Les deux nuits (1829). The ‹Calife de Bagdad›; ‹Jean de Paris,› and ‹La dame blanche› still hold the stage and continue popular. Many other works were written in collaboration with Cherubini, Méhul, Kreutzer and others. Adam, Fétis, Labarre and Zimmermann were the most famous of his pupils. Consult Ferris, ‹Great Musical Composers› (New York 1887); Augé, ‹Boieldieu, biographie critique› (Paris 1908); and Pougin, A., ‹Boieldieu, sa vie et ses œuvres› (Paris 1875).

BOIES, bois, **Horace**, American statesman: b. Aurora, N. Y., 7 Dec. 1827. He went to Wisconsin in 1844; and after working on a farm returned, studied law and was admitted to the bar in 1849. He practised at and near Buffalo till 1867, becoming active in Republican politics during this period; and in the last year removed to Waterloo, Iowa, where he continued law practice. His opposition to the tariff and prohibition policy of the Republican party caused him to unite with the Democrats; and, in 1890–94, he served two terms as governor of Iowa, being defeated for a third term in 1893. He was a conspicuous candidate for the presidential nomination in the National Democratic conventions in 1892 and 1896; and in the campaign of 1896 he supported Bryan.

BOII, bō'ĭ-ī, a Celtic people, who at first inhabited Transalpine Gaul. Their original seat is supposed to have been between the upper Saône and the higher parts of the Seine and Marne. They migrated to Cisalpine Gaul, crossed the Po and established themselves between it and the Apennines, in the country previously occupied by the Umbrians. They are found, 396 B.C., engaged along with the Insubres and the Senones, two other tribes of Cisalpine Gaul, in the capture and destruction of Melpum, a neighboring city, of which the site and history are unknown. They united their forces with the Etruscans, 283 B.C., after the defeat of the Senones, and were defeated by the Romans at the Vadimonian Lake, the scene of a previous defeat of the Etruscans. After another defeat they made a peace with the Romans, which was preserved for 45 years, when the occupation of the territory of the Senones by the latter led to another war, in which the Boii were again defeated. At the commencement of the second Púnic War, 218 B.C., they again attached the Romans and supported Hannibal. From this period they were engaged in almost constant war with the Romans till they were completely subdued by Scipio Nasica, 191 B.C. Many of them were put to the sword; the remainder were at length compelled to migrate, and crossing the Alps found a refuge among the Tauriscans, a kindred tribe in the territory of modern Bohemia, to which the Boii have given their name. They were afterward driven out or exterminated by the Dacians (some say the Marcomans). Part of them migrated about 58 B.C. to Bavaria. The Boii, like the other Gauls, were a people of considerable civilization, possessing a strong love of independence, and formidable from their military disposition and virtues.

BOIL, bo-ĕl', or **BUIL**, Spanish Benedictine priest: b. about 1460; d. 1520. He was the first priest to visit the New World, accompanying Columbus on his second voyage 1493–94, as apostolic vicar of the Indies under papal appointment, and celebrating the first mass in America, assisted by three other friars, Epiphany Sunday 6 Jan. 1494. During the absence of Columbus 26 April to 29 Sept. 1494 extending his discoveries, Boil and three other commissioners were selected to administer the colony of Isabella, but with Margarit and other disaffected ones returned to Spain and by their malicious reports led to the downfall of Columbus.

BOIL, a superficial or deep localized inflammatory process of the skin leading to the destruction of tissue and the formation of pus. In practically all instances some form of infection by a micro-organism, usually the *Staphylococcus pyogenes aureus* or *albus*, is present in boils. In the superficial varieties, the bacteria enter the hair follicles or the sebaceous glands and travel down beneath the skin and here either set up a process of destruction or continue one already begun by a wound. There results a local swelling, with exquisite tenderness, and later a pointing and discharge of the purulent detritus from the boil. In the deep-seated varieties similar processes are in action, but the heading and discharge of the boil is delayed. The marked tenderness is due to the involvement of the nerve fibres in the tissues immediately surrounding the inflammatory centre. The predisposition to the formation of boils varies widely, some people being particularly prone to them. They are apparently more liable in those who are «run down,» or in those whose tissues are non-resistant and appear in many disorders of depressing character. Their presence is due, however, to infection rather than to a state of the blood or other individual condition, which only offers favorable soil for their development. For this reason they are most common in boys and young men who are exposed to infection from barbers' fingers and implements, sweaters and other garments worn in athletic training, etc. It is probable that a favorable soil due to run down or other pathogenic condition favors the reinoculation which is the actual cause of the successive recurrence or «crop of boils» known as furunculosis. An occasional apparent epidemic is also due to repeated infection in the same family or group. A tonic and general hygienic treatment may be helpful but particular stress should be laid upon scrupulous cleanliness of the skin and all that comes into contact with it. In direct treatment of the boil the aim should be to prevent or at least to limit suppuration. If suppuration has already begun applications may be made which will hasten it, but they should be strictly aseptic to prevent further infection. Surgical evacuation of the cavity followed by surgical aseptic measures are advisable.

BOILEAU, Philip, American portrait painter and illustrator: b. Quebec, Canada, June 1863; d. New York, 18 Jan. 1917. He was educated in London, England, and showed a talent for both painting and music. Later in life he became a finished pianist. At 23 he was sent to Milan, Italy to study art and there married a Russian singer, who died later. In 1897 he returned to the United States, making his home in Baltimore, and became a portrait painter. His work became well known in social circles, but about 1902 he came to New York, and through his work, which he exhibited in an art gallery, he attracted great attention. The artist had studied the effects which the hearing of music produces in changing the expression of the face. Among his early works he produced four of his best known pastels, which bear musical names. In 1904 Mr. Boileau received the first prize ($500) in the New York *Herald's* Christmas art competition. ‹That you, Santy?› was the title of the picture which won the prize. Until 1907 Mr. Boileau had searched all his life to find his ideal type of feminine beauty. He finally found his ideal, who was Miss Emily Gilbert, of Philadelphia, then a student in the Sargent Dramatic School, and married her in October 1907. She was his model for the ‹Peggy Head,› ‹The Boileau Girl› and numerous other portrayals of his ideal type of American beauty.

BOILEAU-DESPREAUX, bwälo dā-prā-ō, **Nicolas**, French poet: b. Paris, 1 Nov. 1636; d. there, 13 March 1711. He applied himself at first to the study of the law and afterward of theology, but devoting himself eventually to the pursuit of literature, he produced, within the space of 40 years, a vast number of works, the most important of which is the ‹Art poétique› (1664), in close imitation of the ‹Ars Poetica› of Horace, establishing an æsthetic code for all forms of poetical composition. His satirical poem, ‹Le Lutrin› (1674), and the ‹Dialogue des héros de roman,› (1664), a satire on the poetical romances of his day must also be particularly mentioned. His other writings comprise translations of the classics, miscellaneous effusions on art, music and poetry, and his famous epistles, of which those treating of ‹Le respect humain,› ‹La connoissance de soi-même,› and ‹Plaisirs de la campagne› are the best. When Boileau began to write, Montaigne, Pascal, Malherbe, Corneille, Molière, La Fontaine and other eminent authors had already made their appearance; yet the people were slow to appreciate the genius of the new school, to which they preferred the previous mediocre and imitative writers. Boileau's great achievement was to cure this perversion of taste. He enunciated the principle that nothing is beautiful save what is true, and strenuously opposed all affectation and euphemism. Reason and good sense were his guides; but he was lacking in imagination. He was great as a satirist, and as a critic led the way in simplifying French literary taste. He was called the «Lawgiver of Parnassus.» Like his friend Racine, he was historiographer of Louis XIV, and the recipient of an annual pension of 2,000 francs. His admission to the French Academy did not take place before 1684, owing to his attacks upon some of the members. In his later years he became a Jansenist and engaged in disputes with the Jesuits. He left the reputation of a genial, high-minded and generous man. The best edition of his works is by Gidel (1870–73). See Deschanel, ‹Le romantisme des classiques,› 4th series (1888); Faguet, ‹XVII Siècle, Etudes littĕraires› (1887); Hemon, ‹Cours de littérature› (1889–95); Lanson, ‹Boileau› (1892); Merillot, ‹Boileau› (1892); Walter, ‹Boileaus Wirkung auf seine englischen Zeitgenossen› (1911); and Wright, ‹History of French Literature› (1912).

BOILER, in steam engineering, a closed vessel for the generation of steam under pressure. In days when steam pressures did not exceed a few pounds to the square inch, many forms of boiler were used, that are now out of the question, on account of the intrinsic weakness of their forms. At the present time, when steam pressures are often carried as high as 150 or 250 pounds to the square inch, the strictest attention must be paid to every trifling detail of design and construction, in order to ensure the safety of the structure. The fanciful shapes that prevailed in the days of Watt and other early steam engineers have perforce disappeared, and given place to a limited number of standard types that have been found to be capable of withstanding the severe conditions of modern practice. The types at present in use may be divided into two general classes, according as they are «internally fired» or «externally fired»; that is, according as the fire which furnishes the energy for the formation of steam is contained within the general contour of the boiler, or is situated externally to it. Internally fired boilers are the rule in England, but a large majority of the boilers in use in the United States are fired externally.

Internally Fired Boilers.— The Cornish and Lancashire boilers are the commonest internally fired types. Each consists of a cylindrical shell with flat ends or «heads.» In the Cornish type the boiler is traversed from end to end by a large flue, which is often corrugated, to increase its strength. The fire is built within this flue, upon a suitable grate at one end of the boiler; and the gaseous products of combustion, after passing through the flue, are returned along the outside of the shell, so as to give up still more of their heat to the water in the boiler. The large flue in the Cornish type is an element of weakness, since the tendency of a flue to collapse through the action of an external pressure increases very rapidly with the diameter of the flue. To guard against collapse, the long flue is often provided with strengthening rings, which are riveted to it externally at short intervals. The Lancashire boiler differs from the Cornish type chiefly in having two comparatively small flues in the place of a single large one. Such a construction is intrinsically stronger, and since there is a fire in each of the flues, the fuel can be replenished, and the fires cleaned, alternately. This implies a greater steadiness of pressure, and less strain upon the boiler from the chilling action of the comparatively cold air that enters and strikes against the heated flue-walls when the fire doors are opened. The Cornish boiler is cheaper to build, and the Lancashire boiler is harder to fire, owing to the smaller size of its flues. The Galloway boiler does not differ in any essential particular from the Cornish or Lancashire types, except that its flues are crossed by conical-shaped water tubes, which serve the double purpose of increasing the heating surface, and of stiffening the flues that they traverse. The conical shape is adopted for the cross-tubes chiefly on account of the ease with which tubes of this form can be put in position, by passing the flange of the smaller end through the opening to which the larger end is to be riveted.

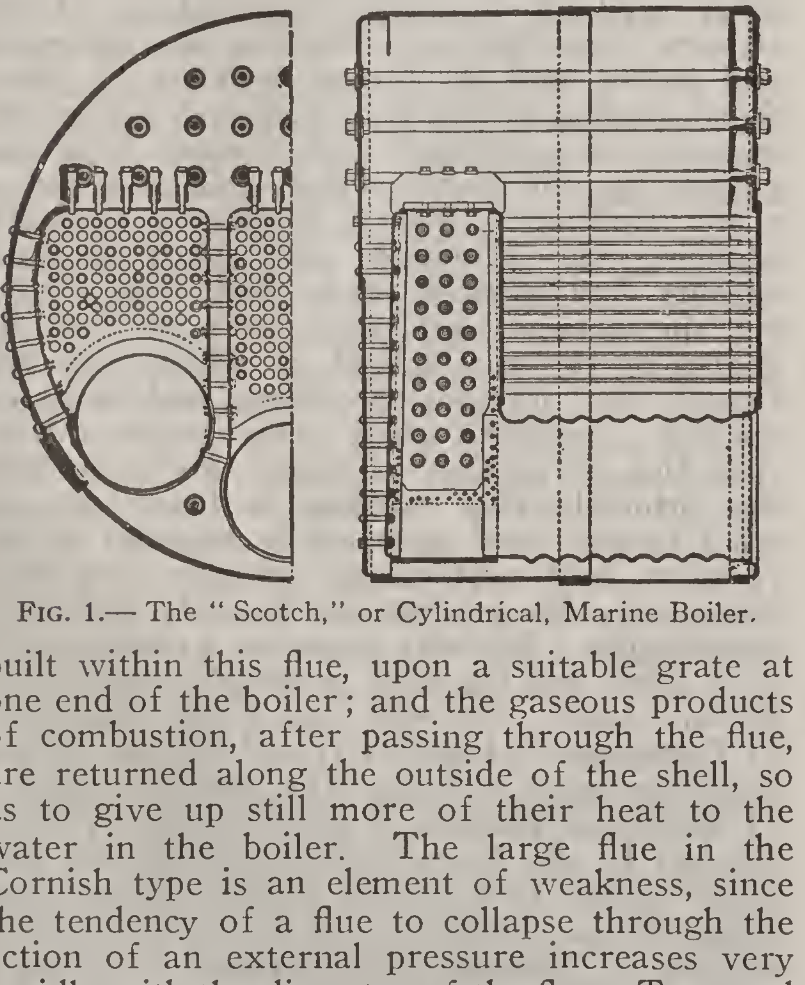

Fig. 1.— The " Scotch," or Cylindrical, Marine Boiler.

The Scotch, or cylindrical marine boiler, shown in Fig. 1, is a very common type in marine practice. It contains several furnaces (three in the illustration), which are usually corrugated. These furnace-flues do not pass through the entire length of the boiler, as in the Cornish and Lancashire types, but each is connected, within the boiler, to a separate «combustion chamber.» The products of combustion pass from the furnace back into the combustion chamber, and then return to the front end of the boiler through banks of small tubes which occupy the water space of the boiler, above the furnace. A «breeching» (or hood) of sheet steel, secured to the front of the boiler, then receives them, and conducts them to the stack.

Among the kinds of internally fired boilers that are more familiar to the engineers of the United States, the vertical tubular boiler and the locomotive boiler deserve special mention. The vertical tubular boiler consists of a cylindrical shell, with flat heads at the top and bottom, and traversed by a large number of small vertical tubes. The Manning boiler, shown in Fig. 2, is a good example of this type. At the lower end, the shell of this boiler is enlarged to provide a greater space for the fire-box than could be had if the shell were of the same diameter all the way. Another object that the designer had in view, in increasing the diameter of the shell in this way, was to give the boiler a certain degree of elasticity. The tubes are likely to be hotter, in service, than the outer shell; and hence they tend to expand more, and thus throw stresses upon the heads and the tube ends. The reversed flange by which the main shell is secured to the fire-box is supposed to yield sufficiently, under the bending stress thus thrown upon it, to relieve the more vulnerable parts of the boiler from the expansion strains to which they would otherwise be subjected. The fire-box of the Manning boiler is surrounded by an annular space (or «water leg») containing water, the inner plates of this space being secured to the outer ones by screw stay bolts that are spaced evenly, at short distances, so that they form the corners of a system of small squares. These bolts are supposed to be screwed into each of the shells of the water leg, and afterward riveted over at both ends. They are also commonly made hollow, or drilled lengthwise with a small central hole, so that if one of them should break or corrode away seriously, the escaping steam or water would attract the attention of the fireman. Vertical tubular boilers are particularly useful when the available floor space in the boiler room is small; but they are often hard to clean out, and hence are not to be recommended when the water supply is known to form considerable deposits of scale matter. Such scale matter, in whatever part of the boiler it is formed, will eventually fall upon the lower tube sheet, or else into the water leg. That which falls into the water leg will do no great harm unless it is allowed to accumulate to an unreasonable extent. Handholes are provided along the bottom of the water leg, on the outer shell, and these should be opened as often as experience with the particular feed water that is used indicates to be necessary, and the water leg thoroughly freed from scale and mud. Handholes should also be provided at or near the level of the lower tube sheet, for a like purpose; but it is not so easy to remove the scale from this sheet as it is to remove it from the water leg. That which lodges around the edges of the tube sheet can be removed without any great trouble, but the deposit that lies toward the middle of the tubes can hardly be got at from the handholes. Yet it is of the highest importance that the tube sheet should be kept free from such deposits, because otherwise the ends of the tubes will become overheated and loosened, and serious mischief, or even disastrous explosions, may follow.

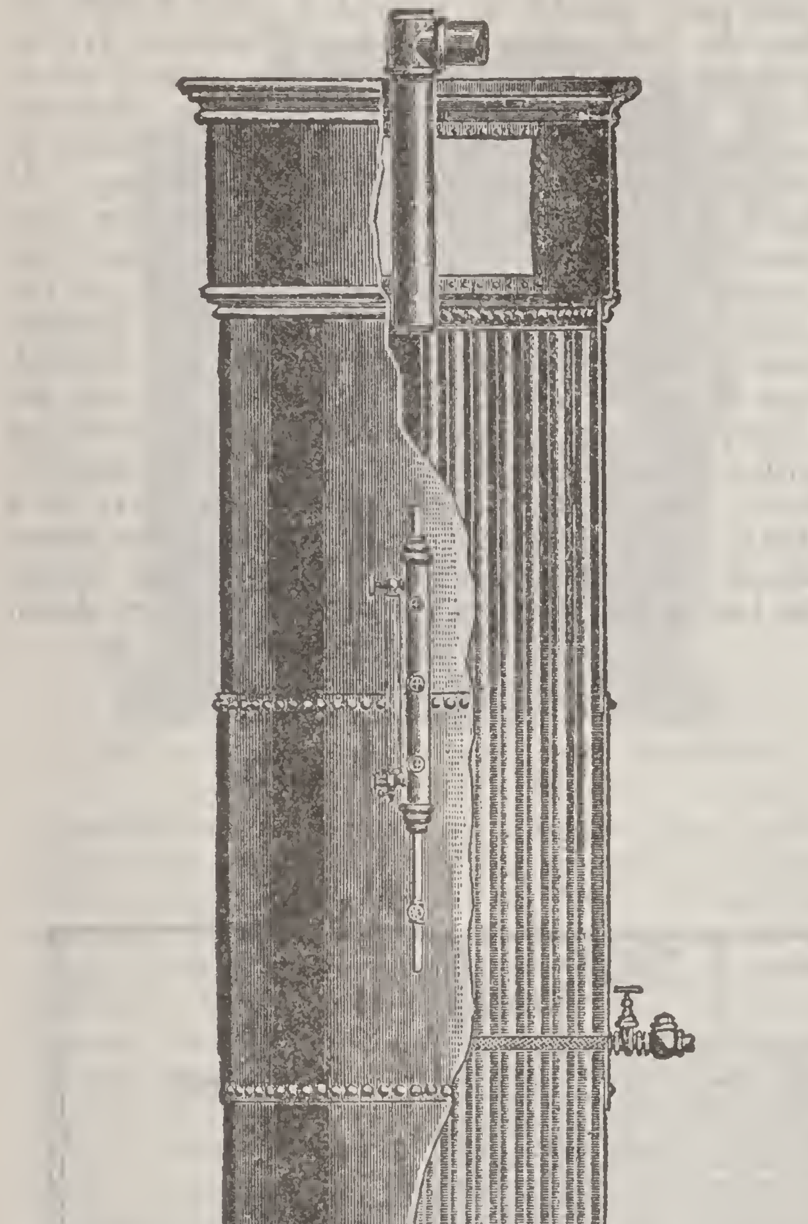

Fig. 2.— The Manning Boiler.

The locomotive boiler is built in a great variety of forms and proportions, but the fundamental principles of design are substantially the same in most of them. Like the vertical tubular boiler, it has a fire-box that is surrounded by a water leg on all sides, though it is open at the bottom for the discharge of ashes, and for the admission of air for combustion. The inner and outer walls of the fire-box are connected by stay-bolts, and the upper sheet of the furnace (technically known as the «crown-sheet») is supported in some efficient manner, so that the pressure of the steam shall not force it down out of position. The support thus necessary for the crown-sheet is sometimes afforded by running «sling stays» from it to the neighboring parts of the outer shell, and sometimes by providing parallel, horizontal girders over the sheet, these being secured to the crown-sheet, at short intervals, by means of hangers, or long, thimbled rivets. Not infrequently these two methods of support are combined in the same boiler, as suggested in the illustration (Fig. 3). The products of combustion pass forward from the furnace, through a bank of small tubes that conduct them to a «smoke-box» or «extension» at the front end, to which the stack is attached. When the locomotive type of boiler is used in stationary practice, the draft required for combustion is provided by a chimney or tall stack, as in stationary boilers of other types; but when used in railway service it is impossible to obtain the draft in this manner, and a «blast-pipe» is therefore provided, through which the exhaust steam from the engine cylinders is discharged up the stack. The gaseous products of combustion are expelled from the «front extension» by the blast of steam, and an equivalent quantity of air is drawn up through the fire. The draft produced in this way is quite powerful. «Baffle plates» are therefore provided in the furnace, in many cases, to deflect the hot gases that come from the fire, and bring them into contact with a considerable portion of the surface of the fire-box, before they pass out into the tubes. The weakest points about the locomotive type of boiler are the crown-sheet and the stay-bolting. If sediment lodges upon the crown-sheet, and thereby keeps the water from direct contact with the metal there, overheating is sure to occur, and the sheet may become so softened and burned as to lose its strength, tear away from its fastenings and permit the entire contents of the boiler to be discharged into the furnace. Many of the explosions of locomotive boilers are due to this action. The stay-bolting at the sides of the fire-box is likewise a source of frequent trouble, because it is found that the stay-bolts sometimes corrode away very rapidly, so that they are in reality badly wasted and weakened, when the engineer in charge believes them to be still sound and strong. As in the vertical boiler, the stay-bolts are commonly made hollow, so that they may automatically give notice of breakage by leaking. This artifice is helpful, but unfortunately it does not invariably work as it is intended to, and broken or badly corroded stay-bolts exist, not infrequently, without giving the alarm that they are supposed to give.

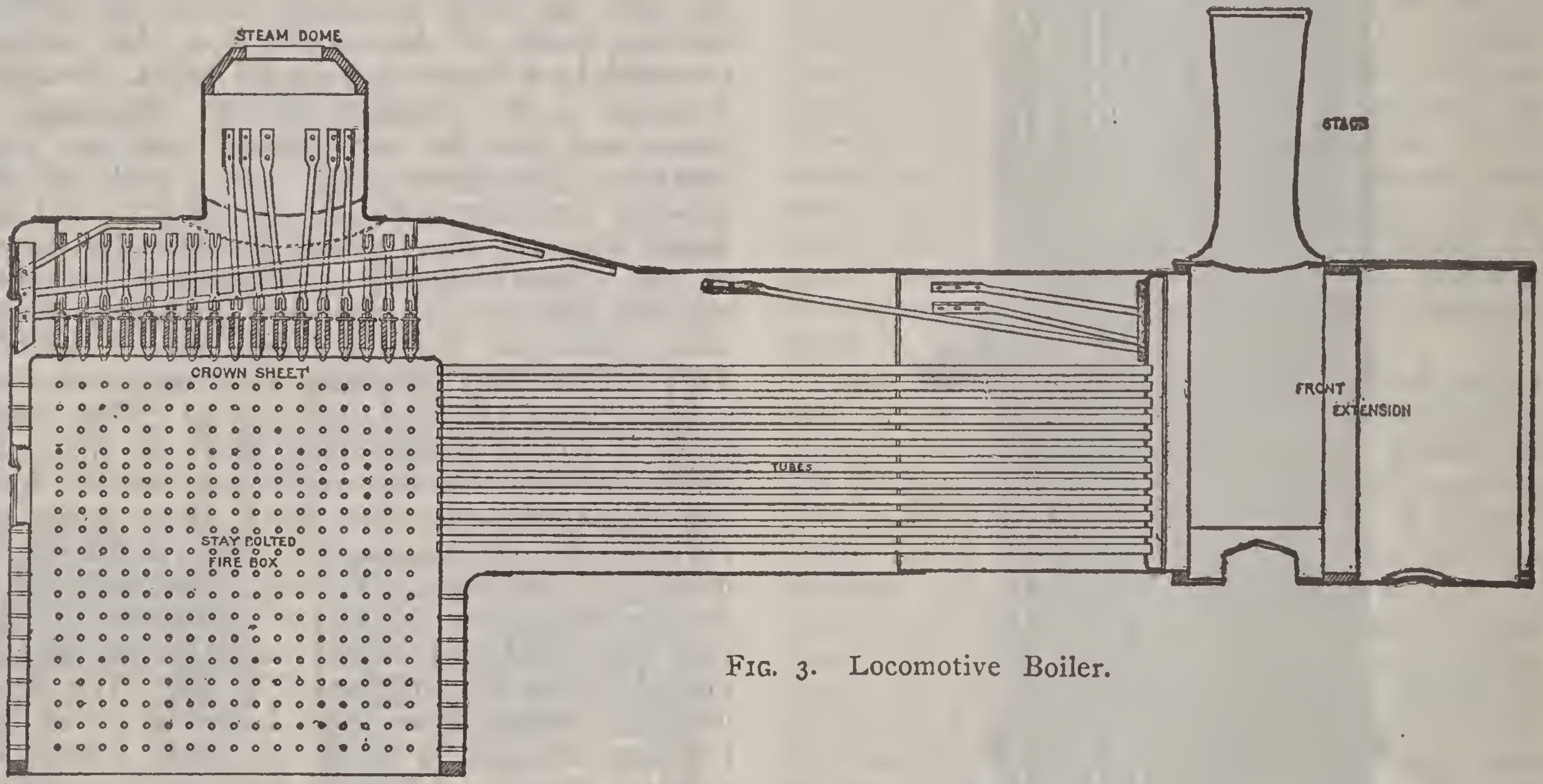

Fig. 3. Locomotive Boiler.

Externally Fired Boilers.— The commonest type of externally fired boiler, in the United States, is the horizontal tubular. A standard design of this boiler is shown, with its brick-work (or «setting») partially torn away, in Fig. 4. It consists of a cylindrical shell, usually composed of three courses or «rings» of plates, riveted together. The circular joints in these boilers are almost invariably single-riveted; but the longitudinal joints are double-riveted, triple-riveted or riveted in some even more substantial manner, according to the pressure that the boiler is to carry. The longitudinal joints, which are not shown in the engraving, should be high enough to be well out of the way of the hot gases from the furnace. A multitude of tubes extend through the boiler from end to end, and the furnace gases pass from the furnace back underneath the shell of the boiler to the «combustion chamber» at the rear, after which they rise and return to the front end through the tubes. They then enter the «smoke box» at the front end, and finally pass upward into the flue that leads to the chimney. The weight of the boiler is sustained by means of cast-iron (or steel) projections, or «lugs,» that are not shown in the illustration, but which are riveted to the shell, and rest upon the side walls of the brick setting. Three pairs of lugs are often provided, but two pairs are sufficient except when the boiler is very long; and two pairs can be brought to a good bearing upon the side walls more readily than three. The boiler should be «anchored» by the front pair of lugs, and the rear pair should be provided with rollers so that the boiler may expand and contract freely, without producing strains in the setting or in itself. The course of the feed-pipe, through which water is introduced into the boiler, is indicated quite plainly in the engraving. If there are several boilers set together in one battery, the main feed-pipe runs along the fronts, just under the projecting ends of the boilers. From this main feed-pipe a branch pipe is taken off for each boiler. The branch pipe is taken off on the left-hand side of the boiler, and near the main pipe it is provided with a ground union, or with a flanged connection. Immediately above the union there is a check valve, and above this is the globe valve which controls the feed. The feed-pipe enters the boiler just above the tubes, and passes down the boiler on the inside, nearly to the back head. It then crosses over to the right-hand side, and discharges downward between the tubes and the shell. It is found by experience that when feed-water is introduced in this way it becomes heated almost to the temperature of the water in the boiler before it is discharged, so that the annoying and often dangerous effects that are produced when the shell is chilled by cooler feed-water are entirely avoided. On large boilers the feed-pipe should have a diameter of at least an inch and a half. The blow-off pipe (which is used for drawing off the contents of the boiler) should be located at the rear end, and should enter the boiler at the bottom, and not through the back-head. To strengthen the construction, the shell should be reinforced, where the blow-off enters it, by a ring of boiler plate securely riveted in place, about the point of attachment of the blow-off. The neglect of this simple matter of reinforcement has led to many serious accidents, through the blow-off pipe pulling out and permitting the contents of the boiler to be discharged through the opening so made. As the blow-off is exposed to the action of the fire, it is also important that it should be encased in some sort of a protecting sleeve. A piece of larger pipe, slipped over the blow-off, is often used for this purpose, but it has the disadvantage of rendering the blow-off itself inaccessible for examination. A piece of asbestos rope coiled about the pipe is equally satisfactory, and permits of easy inspection of the pipe. The blow-off pipe of a boiler that is properly cared for is not likely to burn nor to become otherwise injured. Most of the accidents from the burning of such pipes have been primarily due to permitting the pipes to become choked up with mud or scale, so that water could not enter them freely from the boiler, to keep them properly cool. This may be almost certainly avoided by opening the blow-off (say) twice a day for a moment or two, until any sediment that may have fallen into it has been thoroughly swept out. The blow-off pipe is often so arranged that the elbow comes in the combustion chamber; but this is not good practice, and it is much better to carry the pipe down until it passes below the floor of this chamber. The pipe itself should be about two inches in diameter. It should be provided with a plug cock or with a gate valve, but a globe valve should never be used upon it, since valves of this type do not have a straight passage through them, and are therefore likely to catch and retain pieces of scale, which often prove to be very troublesome impediments. It should be mentioned that those parts of the heads of a horizontal tubular boiler that lie above the tubes are intrinsically weak, and must therefore be sustained in some manner. The necessary support is usually secured by running braces from the heads to the side of the boiler shell, though sometimes the braces are run through the entire length of the boiler, from one end to the other.

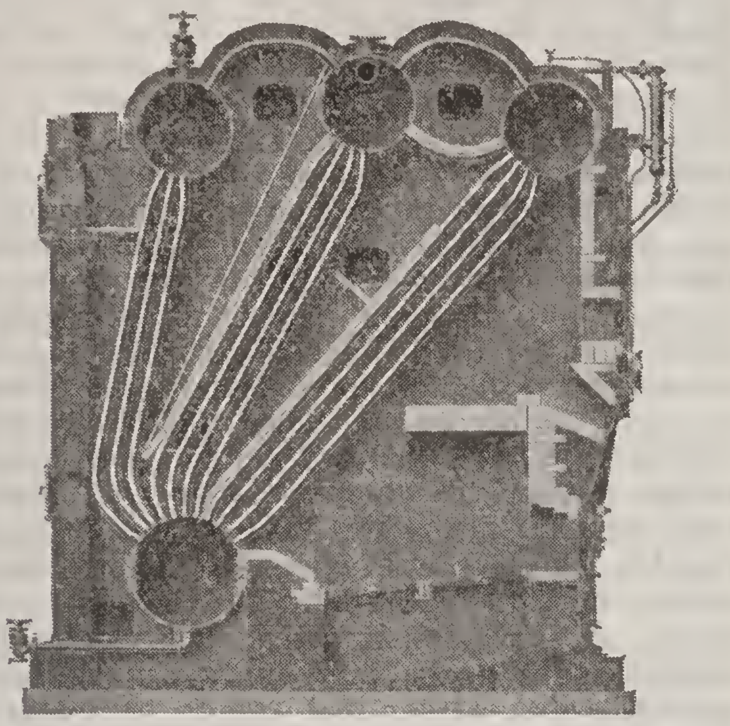
FIG. 4 Stirling Boiler, representative of the semi-vertical water tube boiler.

The horizontal tubular boiler has many excellent points, not the least of which is that it is accessible for examination and cleaning in practically every part. No boiler can be expected to work ideally when the feed water is bad, but the horizontal tubular type gives as good service, even under this trying condition, as can be had from any known type. Its weak points are (1) that it is not so well adapted to extremely high pressures as some of the water-tube types, of which one will be presently noticed; and (2) when it ruptures (as must happen occasionally with every type of boiler) the explosion is likely to be considerably more destructive than the explosion of a sectional boiler, because the large quantity of energy that it contains is liberated more suddenly.

Another class of externally fired boilers that is becoming more and more widely used, both in the United States and Europe, is the «water-tube» type, which is characterized by the fact that its tubular elements contain water, instead of serving for the transmission of the furnace gases as in all the other forms that have been considered above. One of the best-known boilers of this class is the Babcock and Wilcox, which is shown in Fig. 5. This boiler is built up of lap-welded wrought-iron tubes, placed in an inclined position, and attached, both at the front and at the rear, to an upper drum that is made of extra thick steel or iron plates, and double-riveted, or riveted with a butt-strapped joint. The tubes are not vertically over one another, but are «staggered,» so that each tube comes directly over a space in the row below it. The boiler is suspended from steel girders, which rests upon iron columns that are entirely independent of the brickwork; and hence the brickwork may be repaired, or may even be removed altogether, without disturbing the boiler itself. The fire is situated under the front or higher end of the inclined tubes, and the products of combustion are guided by division plates and bridges so that after rising from the fire grate they pass between the tubes to the combusion chamber of the drum, then downward among the tubes again, and finally upward and to the chimney.

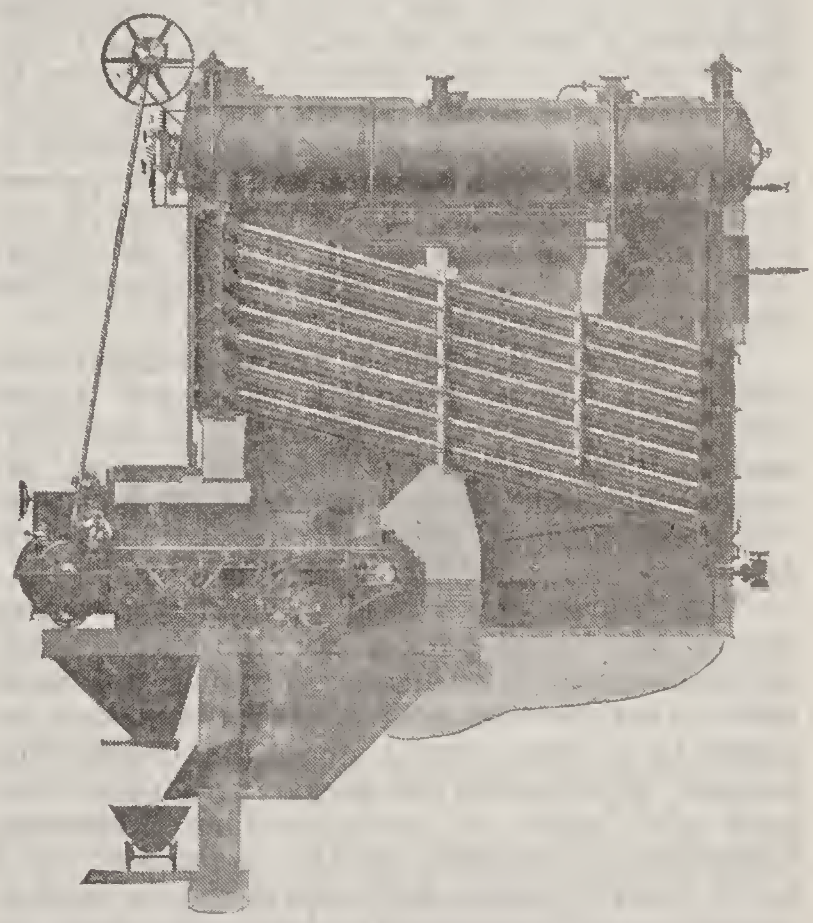
FIG. 5 Babcock & Wilcox Boiler equipped with chain grate stoker and Babcock & Wilcox steam superheater. Representative of the horizontal water tube boiler.

This devious course as well as the staggering of the tubes, is intended to bring the hot gases into intimate contact with the tubes at every point. As the water in the boiler becomes heated, it rises toward the higher end of the tubes, becoming meanwhile partially converted into steam. The column of mixed water and steam ascends into the drum, where its constituents separate, the steam remaining in the drum, while the water flows to the rear, where it passes down through the long, upright tubes, and so completes the circulation.

Water-tube boilers are now used to some extent in marine work, and especially in the naval service. Attention was particularly directed to this branch of the subject by the recent elaborate investigations of the commission appointed by the British Admiralty, for the purpose of recommending a standard type of boiler for use in the British navy. (Consult *Engineering News*, 4 Sept. 1902, p. 176). The Belleville boiler, which has been somewhat extensively used in the past in the British naval service, consists essentially of a series of water-tubes, slightly inclined to the horizontal, and opening at the bottom into malleable iron collector boxes, and at the top into a drum to which the main steam pipe is attached. The feed water is introduced at the middle of the upper drum, and is injected under a pressure in excess of that which is carried upon the boiler itself. To prevent the comparatively cool feed water from entering any of the tubes in which steam is generated, these tubes are caused to project at least eight inches into the drum. The feed passes down through return pipes at the sides of the boiler, and enters the tubes below, after its temperature has been raised by the heat of the furnace sufficiently to prevent injury from contraction strains. The proper regulation of the feed-water supply is one of the difficult practical points about the Belleville boiler; and to overcome it as far as possible an ingenious automatic feed device is provided. There is little or no true circulation in boilers of this type. The tube-groups discharge a mixture of steam and water into the drum, where the steam is supposed to be freed from the water by the aid of a system of baffle plates. An economizer is placed in the stack above the boiler in the most approved modern installations, the construction of the economizer being similar to that of the boiler itself, except that the tubes composing the elements are smaller.

All boilers are supposed to be provided with certain appliances intended to secure safety and uniformity of working. Noteworthy among these are the safety valve and the gauges that indicate the pressure of the steam and the position of the water level. These are described under separate headings.

The «horse power» of a boiler is often spoken of; but the term is a loose one, without any definite significance, because the horse power that can be realized from a boiler depends to a great extent upon the engine that is used to develop the power and upon how hard the boiler is forced. The Centennial Commission adopted, as the definition of a horse power (when that expression is used in connection with a boiler), the «evaporation of 30 pounds of water per hour, when the temperature of the feed water is 100° F., and the pressure of the steam is 70 pounds per square inch, as read from the gauge.»

Steam boilers may explode from any one of a great variety of causes. Of these three are specially worthy of mention: (1) The boiler may be poorly made or poorly designed, so that even when it is new it is not capable of safely withstanding the load that is put upon it. All boilers, however well made, should have a «factor of safety» of five; that is, they should be able to sustain, without bursting, a pressure five times as great as the regular working pressure. (2) A boiler, originally good, may be wasted away, either locally or generally, by corrosion or other form of deterioration, or it may develop defects in service, which detract from its original strength sufficiently to lead to explosive failure. Competent periodical inspection will materially lessen the liability to explosion from causes of this sort. (3) The water in the boiler may become low, through neglect or through the failure of the feed-apparatus, so that the metal becomes overheated or burned and loses its strength. This is the cause almost invariably assigned by the general public and even by minor «experts,» when a boiler explosion occurs, and the attendant is frequently censured for his carelessness when the explosion was really due to some totally different cause. When an explosion is attended by great manifestations of force and energy, it is safe to conclude that a plentiful supply of water was present; for a boiler full of heated water contains vastly more energy than one that is merely filled with steam at the same temperature. (Consult Thurston, 'Steam Boiler Explosions'). Pound for pound, steam contains more energy than water, when the two are at the same temperature; but cubic foot for cubic foot (and this is the way that the comparison should be made in reasoning about a boiler explosion), the water has an enormous advantage, owing to its greater density.

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BOILER SHOP TERMS. The following list includes the principal terms and phrases commonly employed in connection with the work of the design, construction, and use of steam boilers.

Acidulated Water.— Water in which acids have been generated by the introduction of too much tallow into the boiler to prevent incrustation. Its use tends to produce boiler corrosion.

Air Casing.— The enclosed space which envelops the uptake of marine boilers and prevents the loss of heat therefrom by radiation.

Air Spaces.— The openings between the fire-bars of engine boilers and the like.

Anti-fouling Compositions.— See Incrustation.

Ash Pit.— That part of the furnace of a stationary boiler which lies below the fire-bars and immediately in front of the fire-door. It is provided for the reception of the ashes which fall through the bars, and constitutes the main draught entrance of the furnace.

Baffle Plates or Bafflers.— The plates provided in the fire-boxes and flues of steam boilers for throwing the flames and hot gases against the best heating surfaces; also to admit air above the fire, and to prevent the burning and buckling of the door of the furnace.

Ballooning.— The process which takes place within a steam boiler when a sediment of fine mud and scale is carried to the surface of the water by the ebullition of the bubbles of steam. Large boilers are provided with "scum-troughs" for collecting this sediment.

Banding or Bonding.— The securing of the lagging around steam cylinders and boilers with broad encircling bands of sheet-brass or hoop-steel.

Bar-stays.— Solid screwed stays as distinguished from tube-stays or stay-tubes.

Bearing Ring.— The ring which forms the support of the fire-bars in a vertical boiler.

Blast.— The volume of air forced artificially into the furnaces of boilers to quicken the combustion.

Bleeding.— The soaking of red streaks of rust through the scale adhering to the inner surfaces of boilers, indicating the presence of corrosion in the plates underneath.

Blisters.— Defects in boiler plates of poor quality, caused by the retention of cinders or sand therein during the rolling process.

Blow-off or Blow-off Cock.— The pipe and cock situated at the lower part of the boiler by which the boiler is blown-off or emptied of its contents to prevent incrustation. In horizontal boilers of the Lancashire and Cornish type, a pipe called the blow-off bend connects the cock with the blow-off seating through which the boiler is blown-off into the ash pit.

Bear or Boiler Bear.— See Punching Bear.

Bottle-tight.— The seams, rivets, fittings and mountings of a steam boiler are said to be bottle-tight when the joints are so close and perfect that there is not the slightest leakage through them under the application of the water or the steam tests.

Bottling-up.— The temporary confinement of steam in the tubes of a sectional boiler caused by its being generated too rapidly.

Bowling Hoop.— A ring of arch-shaped section, and provided with flanges for the reception of rivets, employed for uniting the sections of furnace shells in horizontal boilers.

Breaking Joint.— The form of joint by which the longitudinal seams of the plates of the boiler are arranged so as to act as supports for each other.

Bridge.— The barrier of brickwork built upon a girder-like casing which stretches across the fire-box of an engine boiler at the rear end of the grate. It serves to throw the flames upward to the heating surface, and also prevents a too rapid escape of the heated gases.

Brine Pump.— A pump employed for periodically drawing off a certain amount of water from a marine boiler to prevent saturation.

Bunker Plate.— A sheet-iron plate which encloses the bunker or space which holds the coal or coke used in the furnace of an engine boiler.

Bursting.— The destruction of a boiler by an excess of internal pressure, as distinguished from collapsing, or the failure of a boiler under the force of an external pressure.

Calorimetry.— The system of measuring the sectional area of a boiler flue, given in square inches.

Capacity.— See Heating Surface.

Carbonate of Lime.— The principal substance which causes the incrustation of steam boilers and water-pipes. It is held in solution in the water as a bicarbonate by the excess of carbonic acid. When the boiler is heated the excess of acid is driven off, and the carbonate is precipitated in the form of a muddy deposit which hardens in the presence of heat into the form of an injurious scale.

Caulking.— The process of burring or driving up the edges of boiler plates along the riveted seams to make them steam and water tight. The caulking of the joints between boiler shells and the flanges of cast-iron man-holes, and safety and stop valve seatings, is accomplished by means of caulking-strips or strips of sheet metal interposed between the wrought-iron of the shells and the cast-iron of the pieces attached thereto. This is rendered necessary on account of the impossibility of caulking the cast-iron.

Chimney.— The tube or funnel through which the waste steam and smoke escapes from an engine or boiler into the open air. Its proportions bear a definite relation to the grate area, and vary in the different types of engines.

Circulating Tubes.— The cross tubes of vertical boilers, or the ordinary forms of tubes used in multi-tubular boilers or surface condensers.

Circulation.— The circulation in a steam boiler is caused by the bubbling up of the lighter boiling water from the heating surfaces through the heavier cooler water in the upper portions which descends and thus comes in contact with the heating surfaces. Efficient circulation is necessary to the rapid generation of steam, and for the prevention of incrustation. It is promoted by the use of properly arranged water tubes.

Clinkering.— The removal of the clinkers or other vitrified material from the fire in the boiler, periodically.

Clothing.— The jacketing or deadening covering placed around boilers to prevent loss of heat by radiation.

Coating.— Non-conducting compositions of felt, silicate cotton, asbestos, etc., which are smeared or placed around steam boilers while the substances are in a plastic state, and which become subsequently hardened by the heat, and prevent the loss of heat from the boiler by radiation.

Cold Water Test.—The hydraulic test, for pressure only, applied to steam boilers, as distinguished from the hot water test.

Collapse.— The destruction of the tubes and fire-boxes of steam boilers by external pressures, which cause them to fail by bending or crumpling inwardly.

Collector.— A cylindrical vessel enclosed in a steam boiler for the purpose of collecting the sedimentary matter contained in the water, which if allowed to remain in the water would produce injurious scale and incrustation. The material thus collected is removed by being blown-out at intervals.

Combined Steam.— Dry and wet steam allowed to mingle together before being used. Its use, at a temperature not exceeding 310° Fahr., tends to diminish the evils of corrosion and priming.

Combustion Chamber.— That portion of a boiler flue in which the gases liberated by the action of the fire are burned. It lies between the grate and the smoke-flue.

Corrosion.— The rusting or oxidation of metals by contact and chemical union with oxygen in the presence of water. Boiler corrosion is either internal or external. Internal corrosion is due to the presence of acidulated water, or to superheated steam in the steam-chamber. External corrosion results from leakage and from contact with damp foundations and seatings.

Corrugated Furnace Tubes.— Furnace tubes which are corrugated in their longitudinal sections. They are extensively used both in land and marine boilers. The elastic character of the corrugations absorbs the linear expansion of the tubes under the influence of heat, and thus prevents the strains which tend to bulge the end-plates of the boiler.

Cross-tubes.— The heating tubes in a vertical or cross-tube boiler. They pass through the fire-box, and therefore, being surrounded by the fire, materially assist in maintaining a rapid circulation of the water. They are cleaned through a mud-door placed opposite the end of each tube.

Crown.— The boiler crown proper is the uppermost plate in the shell of the boiler. It is formed either in the shape of a hollow disc flanged around the edges, and by which it is riveted to the outer shell-plates, or it is made flat and secured in place by means of stays. That portion of the crown which lies over the top of the furnace or inner shell is usually designated as the fire-box crown.

Damper.— The plate, cover or valve, employed for regulating the amount of draught in a boiler or furnace flue. The contrivance is usually balanced with a weight called the damper-weight which assists in its adjustment.

Dead-plate.— The cast-iron plate which lies immediately within the furnace door of an engine boiler. It is provided for the reception, and for the partial coking, of the coal before it is passed forward onto the grate.

Dead Water.— The water which lies below the heating surface of the boiler, and, therefore, is in comparatively slow circulation. In some forms of boilers the flues are brought forward under the bottom so as to heat the dead water and thus induce a more rapid circulation therein.

Dolly.— A riveting tool used by boilermakers for holding under the heads of rivets during the act of riveting.

Double-ended Boiler.— A marine boiler provided with furnaces and flue doors at each end, and therefore fired from each end.

Dry Steam or Saturated Steam.— Steam which has not been superheated, nor mixed with the water of priming. It is the most suitable form of steam for use in engine cylinders.

Economizer.— An arrangement of pipes by means of which the feed-water for steam boilers is heated up to, or higher than, the boiling point.

Evaporative Value.— The relative capacities of the various types of steam boilers to vaporize water, expressed in horse-powers, units of work or in thermal units.

Expanding.— The operation of tightening boiler tubes in the tube plates by expanding or spreading their ends.

Expansion Hoop.— The metal ring which is used in the forming of an expansion joint provided in long boiler flues for the purpose of taking up the linear expansion due to heat.

Feeder.— The mechanism by which the feed-water supply of a boiler is maintained. Usually, it is some form of force pump, or an injector.

Fire-bars.— The grate-bars of the furnaces of engine and other boilers.

Fire-box.— A term which is specifically applied to the furnaces of locomotive and vertical boilers.

Firing.— Boilers are fired both internally and externally. Internally fired boilers are those in which the fuel is consumed in a tube or arrangement of tubes within the boiler itself. The Cornish with one flue, the Lancashire with two flues, the locomotive boiler and other forms of boilers with many internal tubes, the vertical boilers with uptake and cross-tubes, and the marine boilers with return flues are of the internally fired class. Externally fired boilers are those which are not provided with internal fire-boxes or furnace flues. The egg-end, the balloon, the haystack and the wagon boilers are of this class. They are practically obsolete.

Fire Tube Boiler.— A multitubular boiler, as distinguished from a sectional boiler or a water-tube boiler.

Fittings.— The fittings of a boiler comprise the manhole and mudhole doors, the fire-bars and their rings and bearers, the furnace doors, the dampers and frames, etc.

Flame Plates.— The crown plates of a boiler flue or fire-box.

Flanging.— The bending over of the edges of the boiler plates so as to form narrow flanges by which they are attached to each other either by riveting or by welding.

Float.— A buoy employed to indicate the height of the water in the boiler. It is usually made of stone or of iron, and is rendered buoyant by means of a counterpoise the proportion of which, relative to the specific gravity of the float, renders the float quite as susceptible to the variations in the water level as a float of wood. Its movements are observed by means of the float gauge attached to the boiler.

Flash Boiler.— A steam boiler composed of a large number of small tubes which are kept red-hot, and unto which the water is fed in the form of a spray which is instantly converted into steam. They attain their highest development in connection with steam driven automobiles.

Flues.— The flues of a boiler are the arrangements or parts which carry off the waste gas and smoke, and produce the draught.

Flue Plates.— The ends of horizontal boilers to which the flues are attached, or the fire-box crowns of vertical boilers.

Flue Surface.— The area of the flues as distinguished from the grate-area.

Following Joints.— The lap joints of the rings which compose a cylindrical boiler. As all of the joints lap in the same direction, they are called following joints.

Fullering.— A mode of caulking boiler plates. It differs from caulking proper in that the entire edge of the plate is hammered over instead of only a portion of the edge.

Grate.— The series of bars which support the burning fuel in the furnace of an engine boiler. The grate-area is the number of square feet covered by the grate-bars or fire-bars which compose the grate. It is equal to the area over which full combustion can take place, and is usually estimated in relation to the weight of coal burned.

Grooving or Furrowing.— The cutting or corroding which takes place in the seams of improperly stayed boiler plates. It is partly due to the leverage to which those parts are subjected, and partly to the action of acids in the lines of strain.

Gross Section.— The total number of inches contained in the circumference of a steam boiler.

Gusset or Gusset Stay.— A triangular piece of wrought-iron or steel employed to support the flat ends of boilers. Large boilers are provided with five gusset stays at each end, which are secured to the end-plates and the shell by angle-irons.

Holes.— When the rivet holes in boiler plates are punched or drilled so inaccurately that they do not coincide within an amount equal to one-half their diameters when the plates are brought together, they are called half-lap or half-blind holes. When the holes do not correspond within the extent of a whole diameter they are called blind-holes. In riveting, such holes are either pulled together with a drift, or they are reamed out and larger rivets inserted.

Hand Holes.— Holes provided in the shells of steam boilers in cases where a mudhole is impracticable, through which the hand may be introduced for purposes of cleaning and repair.

Hard Water.— Water which contains a large percentage of carbonate and sulphate of lime. Its tendency to produce calcareous deposits makes it very objectionable for use in steam boilers.

Heating Surface.— The entire surface of a steam boiler, comprising the surfaces exposed to the heat on one side and the surfaces in contact with the water on the other side.

Hogging.— A distortion or bending, as of the furnace tubes of boilers, sometimes caused by the expansion of the plates under the influence of heat.

Honeycombing.— A form of boiler corrosion consisting of numerous blank holes or pits. It is due to the action of acids, to galvanic action or to a lack of uniformity in the quality of the plates.

Horizontal Boiler.— One in which the longitudinal axis of the barrel is horizontal, such as the Cornish, Galloway and Lancashire boilers, and various forms of marine boilers.

Inclination.— Some forms of horizontal boilers are inclined forward about half an inch per ten feet of length so as to drain properly through the blow-off cock. Fire-bars are inclined backward about one inch in 10 inches to permit of the fuel being moved rapidly away from the dead-plate.

Incrustation.— Coatings of carbonate and sulphate of lime and other solids formed on the internal portions of engine boilers by deposition from the feed water.

Injection.— The process of forcing water into a steam boiler by means of an injector.

Keelsons.— The wrought-iron or steel saddles which support marine boilers.

Laminated Plates.— Wrought-iron or rolled steel plates in which the several layers are imperfectly united. They are very apt to blister when used for boiler plates.

Leakage.— The loss of feed water due to the alternate expansion and contraction of the plates under the influence of sudden heatings and coolings, which tend to start the rivets and open the seams.

Longitudinal Seams.— The plates which run lengthways of the boiler. They are always arranged to break-joint, and are never placed in line.

Manhole.— An opening provided in the shell of the boiler through which a man may gain access to the interior for purposes of examination, cleaning and repair. It is oval in form and is usually stayed either with a wrought-iron ring, or with a casting.

Marine Boiler.— A horizontal boiler of the return tubular type. They are of many different types, and vary in their arrangement to suit different conditions.

Mudhole.— An opening in the lower part of a boiler through which the sediment deposited by the water is removed. When the boiler is being used, the mudhole is closed by a door called the mud-lid which is inserted within the hole and pulled up against its inner face by means of a bolt. This bolt is attached to the door and passed through a bridge which spans the hole and rests against its outer face. The bolt is tightened to the bridge by means of an ordinary nut.

Multitubular Boiler.— A boiler composed of numerous tubes, through which the hot gases pass from the fire-box to the chimney, and thus heat the water which is in contact with the outer surfaces of the tubes. The locomotive, horizontal and portable boilers are of this type.

Overheating.— The overheating of boiler parts is due either to incrustation, or to an insufficient supply of water. It tends to soften the plates so that they bulge or fracture under the force of internal pressures.

Overpressure.— The pressure developed in a steam boiler exceeding that which it is designed to sustain.

Patch.— A strengthening plate, made properly of steel, riveted or bolted to boiler plates, which have been injured by accident, or have become weakened by corrosion.

Pitting.— The corrosion of boiler plates in patches. See Honeycombing.

Plate.— In the manufacture of steam boilers the use of wrought-iron plates has been completely abandoned for those of steel. The steel plates are rolled in larger sizes, thus reducing the number of riveted seams, and as they possess a much greater tensile strength, they permit of the development of the higher pressures required by modern engines.

Plate Furnace.— A reverberatory furnace used by boilermakers for heating plates preparatory to bending, flanging and welding.

Pressure.— The working pressures in steam boilers vary with the type of the boiler, the material of the boiler plates and the method of construction. They range from 45 to 60 pounds per square inch in those of the Cornish and Lancashire type; from 100 to 200 pounds in the marine boilers; and from 120 to 235 pounds in the portable and locomotive boilers.

Punching Bear or Boiler Bear.— A portable punching machine. The punch is actuated either by a screw, or by hydraulic pressure.

Return Flues.— The flues in horizontal boilers, which are brought from the back of the furnace to the front, and are then carried back again to the chimney.

Return Tubular Boiler.— A marine boiler in which the smoke tubes extend from the back of the boiler forward to the smoke-box. By this arrangement, the products of combustion are carried first to the back of the boiler through the fire-box, and then to the front of the boiler through the tubes.

Ribbed Tubes.— Tubes which are formed so as to present several deep radial ribs on their internal surfaces, and thus increase the area of the available heating surface. They were invented by M. Serve. The Purves tubes are ribbed or corrugated transversely. The use of these tubes is assumed to give much better results relative to the economical consumption of fuel and the increase in steam pressure than may be obtained by the use of the ordinary tubes with smooth surfaces.

Rings.— Metal rings used for uniting the shells and fire-boxes, for the jointing and caulking of seams and other similar purposes. They are either cast or welded.

Ring Seams.— The circumferential joints of a boiler shell.

Salinometer.— An instrument employed for ascertaining the amount of salt in the feed-water of a marine boiler. It is either a hydrometer graduated for degrees of saltness, and by which the specific gravity of the water is measured, or a thermometer by which the boiling point of the water is determined, and the percentage of salt in solution deduced therefrom.

SALTING.— The accumulation of deposits of salt on the plates of a marine boiler. It is not injurious to the plates unless excessive in quantity. The density of the feed-water should not exceed 10 ounces of salt per gallon.

SATURATED STEAM.— Steam which remains in contact with the water from which it has been generated, and therefore retains a quantity of water in suspension. Also called Dry Steam.

SCALING.— The process of removing the scale or deposits of carbonate of lime, etc., from the interior of boiler plates. It is effected by a process of chipping with a keen-edged hammer called a scaling-hammer.

SECTIONAL BOILER.— A boiler composed of a number of small independent heating tubes. The advantages of sectional boilers are the high pressures that may be developed in them, the strength of the small tubes, the prevention of explosions, the rapid transmission of heat, and the facility with which local injuries may be repaired. Their disadvantages consist in the tendency to accumulate deposits in the flues, the tendency to overheating and the difficulty experienced in cleaning them out.

SCUM COCK.— A cock inserted in the side of a marine boiler for discharging the dirt and scum carried to the surface of the water, and which if allowed to remain in the water would deposit and form an injurious scale. See Ballooning.

SOOT DOOR.— A square iron door built into the front ends of the brickwork flues of horizontal boilers, through which the accumulations of soot are removed periodically.

STAYS.— Rods or tubes which connect and stay the flat ends of the boiler. They are made either of copper, wrought-iron or steel. Bar stays and tube stays, also called screwed stays, are first screwed into the ends of the shells or fire-boxes, and then secured either with nuts or by riveting. Gusset stays are riveted.

STEAM ROOM.— The area included between the highest water level in the boiler and the boiler crown. It is the space occupied by the steam.

TESTING.— The strength of steam boilers or their capacity to withstand the stresses due to internal steam pressures are usually ascertained by the application of a pressure of water produced by means of a test pump. The pressure usually applied under test is about twice the working pressure.

THROUGH TUBES.— The flue tubes of horizontal boilers, which pass from one end of the boiler to the other, and are attached to the end plates.

TIE BOLTS.— Long screw bolts employed for the purpose of staying large, flat surfaces, which are inherently weak.

TRANSFER OF HEAT.— The transmission of heat from the furnace of a boiler to the water in the boiler. The rate of transmission or the number of heat units transferred per hour varies according to the amount of heating surface, and is directly proportional to the thickness of the plates. Furnace area is more efficient than tube area.

TUBE PLATES.— The plates into which the tubes of multitubular boilers or surface condensers are inserted and secured.

TUBULAR BOILERS.— Any of various forms of locomotive, marine, portable, horizontal, vertical and sectional boilers having tubes.

UPTAKE.— In a vertical boiler, the internal flue which leads from the furnace to the chimney; in a marine boiler, the return flue.

VENT.— The value obtained by multiplying the calorimeter of a boiler by its length.

VERTICAL BOILER.— A steam boiler of circular horizontal section. Vertical boilers are chiefly used in connection with small steam engines, and are not nearly as economical as those of the horizontal type, as the products of combustion pass from the fire-box too quickly into the chimney.

WATER BRIDGE.— A form of bridge which is made of iron and is continuous with the boiler itself. It is hollow, and therefore assists the circulation of the water which passes through the interior of the boiler.

WATER-TUBE BOILER.— A boiler in which the water and not the fire is in the tubes, as the Yarrow, Thornycroft, Babcock and Wilcox, Belleville and others.

BOILING POINT, the temperature at which a liquid boils, at the ordinary atmospheric pressure. When a liquid is freely exposed to the air, evaporation goes on constantly from its surface, the heat required to make the change from liquid to gaseous form being absorbed from surrounding bodies. If the liquid is artificially warmed, the evaporation goes on at an increased rate; but as its temperature is increased by the application of heat, there comes a time when mere superficial evaporation does not use up all the heat supplied. Bubbles of vapor then form within the body of the liquid, and the liquid is said to have attained its «boiling point.» If the supply of heat be further increased, it is found that the temperature of the liquid remains stationary; bubbles merely form more rapidly, so that the rate of absorption of heat through evaporation is still maintained equal to the rate of supply. The temperature of boiling depends upon the pressure; for at an increased pressure the bubbles are formed in the interior of the liquid with greater difficulty, and therefore not until a higher temperature is attained. The variation from this cause is considerable. Thus the boiling point of water, under a pressure of one atmosphere, is 212° F., while under twice this pressure, or, as it is commonly stated, under a pressure of two atmospheres, it is about 250° F. At the reduced atmospheric pressure prevailing on the tops of mountains, the boiling point of water is lower than 212° F., and advantage of this fact is taken for determining the heights of mountains by observations of the boiling point at their summits. (See HYPSOMETRY). When the liquid is not open freely to the air, but confined in a closed vessel, its temperature can be raised indefinitely by the application of heat, but the vapor in the space above it is denser, and has a greater pressure, at higher temperatures. The correspondence between pressure and temperature, under these circumstances, is very exact, although no simple law connecting the two has been formulated. Rankine gave an empirical formula expressing the relation between them, of which computers of steam tables have made great use ('Miscellaneous Scientific Papers,' page 1); but the physical significance of this formula is unknown. The relation between the pressure and boiling point of a liquid is commonly exhibited by means of a table in which the temperatures of ebullition are set down opposite the corresponding pressures. The phenomena described above in connection with the free evaporation from a liquid exposed to the air are in general true, but certain qualifications must be made, under certain special conditions. Thus, it is difficult to induce water to boil when it has been freed from dissolved air; and in the entire absence of such air De Luc found that water can be heated as high as 234° F., under ordinary atmospheric pressure, before boiling, if the experiment is performed with proper care. A liquid thus heated to a temperature in excess of the normal boiling point corresponding to the pressure to which it is subjected is said to be «superheated.» When boiling does finally occur in a superheated liquid, it takes place with almost explosive suddenness, and the loss of vapor is exceedingly rapid until the temperature of the liquid has been reduced by this means to the normal temperature corresponding to the pressure prevailing at the time. The temperature at which ebullition takes place is also influenced to a certain extent by the nature of the vessel in which the liquid is heated. Thus Marcet found that in a glass vessel which had been carefully washed out with sulphuric acid, and then well rinsed, pure water does not boil until a temperature of 223° F. has been attained. All results of this kind are of an indefinite character, however, since they relate to the temperature at which boiling first begins, rather than to the state in which the liquid and its vapor are in a condition of permanent thermal and mechanical equilibrum. Superheated water is in an unstable state, and, according to some authorities, not a few boiler explosions have been due to the superheating of the water present, from some cause, and the subsequent explosive liberation of steam, as the water returned to its normal condition; but this theory as to boiler explosions has never been substantiated by experiment or otherwise. A liquid has a higher boiling point, when it contains some substance in solution, than it has when pure. The effect of dissolving salt or any other electrolyte is complicated by the occurrence of dissociation; but for dilute solutions of non-electrolytes, like sugar, the following law, first given by Raoult, holds true: If a series of dilute solutions of such substances be prepared, each solution containing, per unit weight of the solvent, an amount of solid proportional to the molecular weight of the solid, then the solutions so prepared will all boil at the same temperature. (See Solutions). For marking the «boiler point» upon thermometers, it is the universal practice to expose the thermometers to the steam rising from the boiling water, rather than to immerse them in the water itself; for the temperature of the steam is independent of the presence of traces of dissolved substances in the water, and also of the action of such accidental or irregular cause as the superheating of the water. See Evaporation; Thermometry.

BOILLY, bwä'yę, **Louis Leopold**, French painter: b. La Bassée, France, 1761; d. 1830. His father taught him for some time but it is not known who his other masters were. He was greatly influenced by the genre painters of the Dutch school. He is known as the «Little Master of the Revolution.» His pictures are small in size, accurate in design, color and remarkable for their spontaneity. To his prolific brush are attributed about 5,000 paintings, chiefly historical. The period represented on his canvases ranges from the time of Louis XVI to the end of the Restoration. Among his works are ‹Arrival of the Diligence› (1803); and ‹Isabey's Atelier.› Consult the monograph by Harisse (Paris 1898).

BOINÆ. See Boa; Boidæ.

BOIS, Jean du, Joannes à Bosco, or **Boscius,** French preacher and diplomat: b. about middle of 16th century; d. in prison at Rome, 28 Aug. 1626. He entered the order of the Celestines, but he soon secured permission from the Pope to leave it to take part in the Christian army of Henry III, the self-styled Emperor of the Monks. At the close of hostilities he again entered his order and became one of the most eloquent and renowned preachers of his day. He preached before Henry IV and became the closest friend of Séraphin Olivier whom he followed to Rome; and there, later on, he was destined to preach his funeral sermon. He became the bitter enemy of the Jesuits and attacked them in his sermons. Sent to Rome (1611) on a mission for the French government, he was arrested on his arrival there and confined in Saint Ange prison where he remained until his death 15 years later. Most of his works, which are of a controversial nature, are in Latin.

BOIS D'ARC, bwä-därk, the osage orange (q.v.).

BOIS DE BOULOGNE, bwä-dė boo-lō-ny', once a forest abounding with game near the gates of Paris, now a beautiful park belonging to the city; area, 2,250 acres. The greater part of the old trees were destroyed during the Revolution. When Napoleon chose Saint Cloud for a summer residence, he ordered young trees to be planted, had the place enclosed with a wall and stocked with game. In 1815 the British troops under Wellington were stationed in it, and many of the trees were then cut down, but new ones were planted by Louis XVIII. In 1852 it came into the possession of the municipality, and is now one of the gayest holiday promenades. During the Franco-German War of 1870–71 a large number of the trees were cut down by the French in preparing for the defense of Paris. During the Commune in 1871 several sanguinary encounters took place here. In the Bois are the noted Auteuil and Longchamp race courses, and also the Jardin d'Acclimatation.

BOIS DE VINCENNES, bwä dė văṅ-sĕn, the ancient hunting park of Louis IX; now a pleasure-ground of 2,250 acres on the outskirts of Paris. A large portion of it is devoted to the purposes of the Champ de Manœuvres, drill-ground, a race course and polygone d'artillerie. Its scenic beauty is quite equal to that of the Bois de Boulogne but it is less frequented by the *beau monde.*

BOIS-GUILBERT, bwä-gęl-bãr, Sir **Brian,** a character in Scott's ‹Ivanhoe.› He is a Knight Templar whose passionate attachment to the beautiful Jewess Rebecca, severe struggle with his pride and tragical death in the lists, form one of the most dramatic features of the romance.

BOIS-LE-DUC, bwä-lė-dük (Dutch Hertogenbosch), the capital of the province of North Brabant, in Holland, 49 miles southeast of Amsterdam, at the confluence of the Dommel and the Aa, which form, by their junction, the Diest. It was a strong fortress up to 1876, but has ceased to be kept as such. It is intersected by canals, and among its buildings the chief is the cathedral, in late Gothic, built in 1458–98, with an old tower of the 11th century, and a chapel of the 13th, the whole now restored. Other buildings are the town-hall, palace of justice or court-house, the episcopal palace and the government buildings. Bois-le-Duc has many industrial establishments and an active trade. Its chief manufactures are gold and silver wares, cigars, mirrors, boots and shoes, etc. It was founded by Geoffrey III, Duke of Brabant, in 1184. Bois-le-Duc separated from the Dutch states suffered much in the religious wars of the 16th century, and was captured by the Dutch in 1629. On 14 Sept. 1794, the French defeated the English here, and on 9 October of the same year it surrendered to Pichegru. In January 1814, it was taken by the Prussians, but the citadel held out. Pop. 35,214.

BOISE, James Robinson, American educator: b. Blandford, Mass., 27 Jan. 1815; d. Chicago, 9 Feb. 1895. He was graduated at Brown in 1840, and received an appointment there as tutor in ancient languages. In 1850 he went abroad to study; in 1852 became professor of the Greek language and literature in the University of Michigan; in 1868 took the same chair in the University of Chicago. Upon the establishment of the new University of Chicago, he was appointed professor emeritus of New Testament Greek. The numerous classical textbooks edited by him were widely used. Besides these, he published ‘Notes on the Greek Text of Paul's Epistles to the Ephesians, Colossians, Philemon and the Philippians’ (1884); ‘Notes on the Greek Text of Galatians and Romans’ (1886).

BOISE, Otis Bardwell, American composer and music teacher: b. Oberlin, Ohio, 13 Aug. 1844; d. 2 Dec. 1912. After studying music in Leipzig he settled in New York as a teacher of composition and for a time was organist of the Fifth Avenue Presbyterian Church. During 1876–77 he was again in Europe studying and had the benefit of Franz Liszt's advice and criticism after which he resumed teaching in New York. In 1881–88 he resided in New York, removed to Berlin in 1890 and there was a successful teacher of composition. Returning to America in 1908 he became professor of composition at the Peabody Conservatory of Music. His compositions include a concertstück for piano and orchestra, a G minor piano concerto, a symphony and two concert overtures. He published ‘Harmony Made Practical’ (1900); ‘Music and Its Masters’ (1901), and many articles in journals devoted to music.

BOISE, Idaho, capital of the State and county-seat of Ada County, on the Boise River and the Union Pacific Railroad, 45 miles southwest of Idaho City. It occupies the site of a former trading post of the Hudson Bay Company; is in an agricultural and a rich mining region; and is supplied with pure hot water from a flowing boiling well. The city is said to be the only one in the world having a natural supply of hot water. Boise has several important industries of which the chief are lumber, dairying, meat packing and stock raising. Its manufactures include cigars and tobacco, brooms, pipe, sashes and doors, harness. It contains several fine schools, a business college, a Carnegie library and a natatorium. In 1863 Major Tugabill established a military post here, which was organized as a city the year following. It is under the commission form of government. Pop. (1920) 21,393.

BOISGOBEY, bwä-gō-bā, **Fortuné Abraham du,** French novelist: b. Granville, 11 Sept. 1821; d. February 1891. In 1844–48 he was paymaster in the army at Algiers, and began to write in 1868, somewhat on the lines of Emile Gaboriau. His novels were popular, and include ‘The Scoundrels’ (Paris 1873); ‘Chevalier Casse-Cou’ (1873); ‘The Mysteries of Modern Paris’ (1876); ‘The Demi-Monde Under the Terror’ (1877); ‘The Old Age of M. Lecoq’ (1878); ‘The Cat's Eye’ (1888); and ‘The Cold Hand’ (1879).

BOISSERÉE (bwä-srā) **COLLECTION,** a number of pictures exhibited in Munich, which were collected by the brothers Sulpice (1783-1854) and Melchior Boisserée (1786–1851) and John Bertram, men who, animated by love of the arts, began, at the time of the destruction of the monasteries during and after the French Revolution, to purchase old pictures, and afterward completed their collection by the addition of many valuable paintings of the old German school. By this collection the brothers Boiserée and Bertram happily realized the idea of a historical series of old German paintings. It is to their endeavors that we owe the discovery that Germany possessed, as early as the 13th century, a school of painters of much merit, which, like the Italian, proceeded from the old Byzantine school, but became, in the sequel, distinguished by excellences of its own. We owe to these collectors, also, the restoration to favor of the forgotten Low German masters, and a just estimation of John van Eyck as the creator of the genuine German style of painting. The most distinguished connoisseurs and artists, including Goethe, Canova, Dannecker and Thorwaldsen, have strongly expressed their admiration of this collection. It was first brought together and exhibited at Heidelberg (1810), and afterward removed to Stuttgart, where the King of Würtemberg assigned it a suitable building. The collection remained there till 1828, when King Louis of Bavaria, having purchased it in the previous year for 120,000 thalers ($90,000), removed it to Schleissheim, and in 1836 most of the paintings were sent to Munich. A lithographic work on this collection was published in 40 parts between 1821 and 1840. Consult ‘Sulpiz Boisserée’ (a biography, 1862).

BOISSIER, bwä-syā, **Marie Louis Gaston,** French archæologist and historian: b. Nimes, 15 Aug. 1823; d. 10 June 1908. After studying at the École Normale he taught rhetoric in Nimes 1847–57; professor of Latin eloquence and literature at the Collège de France from 1861; was elected to the French Academy in 1876, and to the Academy of Inscriptions and *Belles-lettres* 1886. His literary style was much praised for its clearness and beauty. His works comprise ‘Le poète Attius’ (1857); ‘Étude sur la vie et les ouvrages de Terentius Varron’ (1861); ‘La religion romaine, d'Auguste aux Antonins’ (1883); ‘La fin du paganisme’ (1894); ‘Cicéron et ses amis’ (1892); and ‘Promenades archéologiques: Rome et Pompéi’ (1892); the two last named being marvelously accurate and vivid reconstructions of the antique spirit and atmosphere. Other works are ‘Roman Africa’ and ‘The Country of Horace and Virgil.’

BOISSIEU, bwä-syė, **Jean Jacques de,** French painter and engraver: b. Lyons 1738; d. there 1810. He was intended by his parents for the magistracy, but manifested such a decided inclination for drawing that he was allowed to follow it. After remaining for some time at Lyons and painting some excellent imitations of the Flemish school, he visited Paris, where his intimacy with the most celebrated artists of the time enabled him greatly to improve his style. On his return to Lyons he devoted his attention chiefly to engraving. He afterward accompanied the Duc du Rochefoucauld to Italy, and having studied the works of the great masters with the greatest assiduity, resumed painting; but as the use of oil injured his health, he, shortly after his return to France, abandoned it finally for engraving, in which his reputation soon became European, and his works were eagerly purchased by wealthy and distinguished amateurs. His engravings amount to 140 plates, among which that of ‘Le Charlatan,’ after a picture by Karel Dujardin, is considered his masterpiece.

BOISSONADE, bwä-sō-nạd, **Jean François**, French classical scholar: b. Paris, 12 Aug. 1774; d. Passy, 8 Sept. 1857. He was educated at the Collège d'Harcourt, and at the age of 18 was attached to the Ministry of Foreign Affairs. He subsequently became a contributor to periodical literature in the ‘Magasin Encyclopédique’ of Millin and the *Journal de l'Empire,* the precursor of the *Journal des Débats.* Ancient and modern literature, both French and foreign, grammatical criticism, bibliography and natural sciences occupied his pen. In 1813 he was admitted a member of the Academy of Inscriptions and Belles-Lettres. He afterward wrote about 150 articles for the ‘Biographie Universelle.’ He became, in 1809, assistant to Larcher, as Greek professor of the faculty of letters in Paris, and four years afterward he succeeded him both in the faculty and in the institute. Finally, in 1828, he was called to the chair of Greek literature in the Collège de France. He gave a great impulse to the study of the ancient classics. He has produced no complete work in French, but is said to have written Latin with natural grace and elegance, and his editions of the classics are highly esteemed.

BOISSY D'ANGLAS, bwä-sẹ däṅ-glạs, **François Antoine** (Comte de), French statesman of the revolutionary period: b. Saint Jean-la-Chambre, near Annonay, 1756; d. Paris, 20 Oct. 1826. He studied at Annonay, and was admitted as an advocate to the Parliament of Paris. In 1789 he was elected to the States-General, where he was a moderate advocate of revolutionary principles. In 1792 he was returned as a deputy to the convention. He voted against the death of Louis XVI, and after the fall of Robespierre was appointed secretary of the convention and a member of the Committee of Public Safety (1794). He was created a peer by Louis XVIII in 1814, but supported Napoleon during the Hundred Days, and was consequently expelled from the peerage by a royal ordinance, but shortly afterward reinstated. He was the author of an essay on the life and writings of Malesherbes (1819–21) and ‘Études Littéraires et Poétiques d'un Vieillard’ (1825). The fame of Boissy d'Anglas rests chiefly on a scene in the convention of 1795, when the hall was invaded by an angry mob demanding bread and the Constitution of 1793. Called temporarily to take the chair, in the absence of the president, Boissy had presented to him the head of a deputy, Féraud, which had been cut off by the insurgents and placed on the end of a pike. He saluted it, and continued calmly facing the mob, and to his courage and firmness the safety of the convention at this crisis is attributed. Such is the popular version of a story of which the most various and contradictory accounts are given.

BOITO, bō-ē'tō, **Arrigo**, Italian composer: b. Padua, 24 Feb. 1842. His great work, the opera ‘Mefistofele,’ occupied him for nearly 20 years. The garden scene was written while he was a student in the Milan Conservatory in 1856, and the score was finished for the stage in 1868, the composer having done much literary work in the interim and lived variously in France, Germany and Poland. On 5 March 1868 ‘Mefistofele’ was sung at La Scala, Milan, the performance lasting six hours, much interrupted by hissing and applause, and its failure was evident. Boito then remodeled the opera, and in 1875 it was produced at Bologna with great success. It was sung in other cities with equal success, but it has never been a popular opera in the full sense of the word. In 1883 it was produced at the New York Metropolitan Opera House with Campanini and Nilsson in the cast and was revived in 1896 and again in 1901. The opera is considered one of the most important of modern Italian operas, marking, as it does, the precise point where the modern school of Italian composition, illustrated by the later works of Verdi, Mascagni, Puccini, etc., diverges from the work of the Bellini and Donizetti school. Boito's other operas, ‘Ero e Leandro,’ ‘Nerone’ and ‘Orestiade,’ have never been sung. He wrote the libretti for Faccio's ‘Amleto,’ Ponchielli's ‘Gioconda’ and for Verdi's ‘Otello’ and ‘Falstaff,’ and translated several of Wagner's works. He also issued novels under the pen name of «Tobio Gorrio.»

BOIVIN, bwä-văn, **Marie Anne Victoire** (Gillain), French midwife, upon whom a diploma of M.D. was conferred by the University of Marburg, noted for her writings on obstetrics: b. Montreuil, 9 April 1773; d. 16 May 1841. She was educated in a nunnery, where by her talents she attracted the attention of the sister of Louis XVI, Madame Elisabeth. When the nunnery where she was placed was destroyed in the course of the Revolution, she spent three years in the study of anatomy and midwifery at Etampes. In 1797 she married an employee at Versailles, of the name of Boivin, but on being left after a short time a widow with a child and without fortune, undertook the office of midwife at the Hospital of the Maternity, and, in 1801, was appointed chief superintendent of the institution, to which, in accordance with her suggestion, a special school of accouchement was added by Chaptal. Her ‘Mémorial de l'art des accouchements,’ published in 1824, passed through several editions. The Empress of Russia invited her to Saint Petersburg, but she declined. She also published ‘Mémorial sur les hémorrhagies internes de l'uterus’ (1818); ‘Recherches sur une des causes les plus fréquentes et les moins connues de l'avortement’ (1828); ‘Traité pratique des maladies de l'uterus et de ses annexes’ (2 vols., 1833).

BOJACA, bō-zhä'kạ, **Battle of**, so called from having been fought near the bridge of the small town of Bojaca, not far from the city of Tunja, between the Spaniards under Barreyro and the united forces of Venezuela and New Granada, commanded by Bolivar. It occurred 7 Aug. 1819, and was decisive of the independence of New Granada. Among the Republicans, Generals Anzuategui, Paez and Santander distinguished themselves; and the Spaniards sustained a total defeat, their general, most of their officers and men, who survived the battle, together with all their arms, ammunition and equipments, falling into the hands of Bolivar. So complete was the destruction of the Spanish army that the viceroy instantly fled from Santa

Fé, leaving even the public treasure a prey to the conquerors.

BOJADOR, bō-zhạ-dôr′, **Cape**, a promontory on the west coast of Africa; lat. 26° 7′ 10″ N.; long. 14° 29′ W. It is one of the projecting points of the great desert of Sahara, and forms the west extremity of a rocky ridge called the Jebel-khal or Black Mountain. The coast north of this cape is extremely dangerous, being shallow to a great distance out, and constantly enveloped in a haze. It has been, in consequence, the scene of many a melancholy disaster. Cape Bojador was long the limit of navigation toward the south and was first passed by the Portuguese in 1433, and from them received its name signifying «bulging, rounded cape.»

BOJAL, Philippines, an island north of Mindanao, about 40 miles long by 30 miles wide. It is woody and mountainous. Rice and gold are its chief productions. Pop. 187,000.

BOJER, Johan, Norwegian anti-intellectualist author of plays and novels: b. Drontheim 1872. He supported himself by commercial work while studying at the local Latin school, and secured an income sufficient to enable him to continue his education by writing his first play, which won a scholarship. That play, entitled ‹A Mother,› was followed in 1895 by the story ‹Helga,› and afterward came ‹Moder Lea› in 1900, ‹Troens Magt› in 1903, ‹Vortrige› in 1908, ‹Kjælighetens Oine› in 1910, and ‹Liv› in 1911. The following titles complete his bibliography: ‹Theodora› (Kristiania 1902); ‹Brutus› and ‹Eventyr› (both Côpenhagen 1904); ‹Et Folkatag› (Kristiania 1909); ‹Kjaerlighetens Öine› (Kristiania 1910); and ‹Fangen, som Sang› (Kristiania 1913). Two of his works have been translated into French and bear the titles ‹Maternité› and ‹Sous le Ciel Vide.› The psychological attitude of the writer, though sometimes bitter and paradoxical, is often very fine and just. His most intelligent interpreter is Virgile Pinot, author of ‹Les Idées du Romancier Iohan Bojer› (in *La Revue du Mois,* Tome XVII, Paris 1914).

BOK, Edward William, American editor: b. Helder, Netherlands, 9 Oct. 1863. He came to the United States in infancy, and was educated in the public schools of Brooklyn. From 1884 to 1888 he was a stenographer. At 19 he edited the *Brooklyn Magazine* and from 1886 to 1891 he successfully conducted the *Bok Syndicate Press.* He has edited the *Ladies' Home Journal* since 1889, has been vice-president of the Curtis Publishing Company since 1891. He has taken a leading part in various civic improvements, and has published ‹The Young Man in Business› (1895); ‹Successward› (1895); ‹Why I Believe in Poverty› (1915).

BOKELMANN, bo′kel-man, **Christian Ludwig**, German painter: b. Saint Jürgen 1844; d. 1894. He was a pupil of Wilhelm Sohn at Düsseldorf and became distinguished as a genre and portrait painter. Among his works are ‹House of Sorrow›; ‹Pawnbroker's Shop›; ‹Opening of the Will›; ‹Portrait of Klaus Groths›; ‹A Village Fire›; ‹Strike of Laborers›; ‹North Frisian Peasant House,› and ‹Alone.›

BOKER, George Henry, American poet, dramatist and diplomatist: b. Philadelphia, Pa., 6 Oct. 1823; d. there, 2 Jan. 1890. He was the son of a banker; was graduated from Princeton in 1842; studied law; and was United States Minister to Turkey in 1871–75, and to Russia in 1875–79. His plays include ‹Calaynos› (1848); ‹Anne Boleyn› (1850); ‹Francesca da Rimini›; ‹The Betrothed›; and ‹All the World's a Mask.› He published also ‹Poems of the War› (1864); ‹Königsmark and other Poems› (1869); ‹The Book of the Dead› (1882); and ‹Sonnets› (1886). ‹Francesca› is his best play and has been several times put upon the stage by Barrett and other actors.

BOKHARA, bŏ-kä′rạ, a khanate of central Asia, practically vassal to Russia, bounded on the north by Russian Turkestan, west by Khiva and the Russian Trans-Caspian territory, south by Afghanistan and east by Russian Turkestan. It formerly occupied considerably more territory than now, having been reduced by the conquests and encroachments of Russia, which have been only partially compensated by some additions. The present area of the khanate is estimated at about 92,000 square miles. The country is to a great extent occupied by deserts and low and naked ranges of mountains, and the cultivated portions of it are confined to the valley of the rivers, especially the Oxus or Amoo Daria, which forms the southern boundary for a considerable distance, and then flows from southeast to northwest parallel to and not far from the frontier of the country. Bokhara lies between lat. 37° and 41° N., and in greater part is no more than 1,100 or 1,200 feet above the level of the sea, but in the extreme east is mountainous. The climate is subject to great extremes, being warm in summer and very cold in winter. There is very little rain, on which account it is necessary to resort to artificial irrigation. Barley, rice, tobacco, wheat, cotton, flax and dye plants are raised in large quantities. Silk is also produced. The pastoral industries are extensive. Manufactures are in a backward state and are confined mainly to cotton and woolen textiles of a coarse nature. Leather goods and small metal articles are also produced. Gold, salt, iron and copper are mined. Bokhara occupies an important place in the commerce of central Asia. The trade is with India, Persia and Russia and is carried on by caravan and also by the Trans-Caspian Railway. Sugar, tea, indigo and drugs are the principal articles imported while lamb skins, cotton, silk, fruits and other agricultural produce are exported. The government is an absolute monarchy, the Emir having autocratic powers, which are delegated to several officials, who each administer a separate department. The territory is divided into districts, each of which is administered by an official called a bek, who is under obligation to deliver a stated sum annually to the Emir's treasury. The surplus tax collections are retained by the bek, who for private gain often imposes exorbitant taxes on the population of his district. There is an army, consisting of a regular force and a militia. It is mainly made up of volunteers, but in case of a holy war every able-bodied follower of Islam is liable to military service. The total population amounts to about 2,250,000 and consists of the Uzbecks, who are the ruling race, and to whom the Emir belongs; the Tajiks, who form the majority in the capital; the Kirghizes, less numerous than the Tajiks; about 60,000 Arabians, descendants of the soldiers who were brought into the country by the third Caliph of Bagdad on the occasion of the conquest of Turkestan; Persians who have chiefly been brought as slaves to Bokhara; Turcomans, Hindus and about 10,000 Jews who live in the towns beyond the protection of the law and accordingly oppressed by the other inhabitants. Since the separation of Samarcand there are now only two towns of importance in Bokhara, namely, the chief town, Bokhara, with a population of about 60,000; and Karshi, with about 25,000. Besides these there are a few small towns and some hundred villages in the country. The capital, according to Vámbéry, the centre of Tartar civilization, is ill built and has a gloomy aspect, and in luxury of dress and mode of life is far behind the towns of western Asia. Among the people there reigns the utmost moral corruption along with a rigorous adherence to outward forms. The country is distinguished from the other countries of central Asia by its numerous schools, and in the same proportion by the amount of culture diffused among the people generally; but the women are even more degraded than in other Mohammedan countries. The rule of the Emir is absolute, though he is to some extent under the influence of the clergy. The manufactures are unimportant, but there is a very considerable caravan trade, cotton, rice, silk and indigo being exported, and woven goods, sugar, iron, etc., being imported. There is also now a trade by railway, since the making of the line from the Caspian to Samarcand. Bokhara is remarkable for its religious fanaticism, and various European travelers have been exposed to danger. After Alexander Burnes had visited Bokhara on a commission from the government of India in 1832, the British Ambassador in Teheran sent Colonel Stoddart in 1838 to obtain from the Emir Nasrulla the deliverance of the Russian prisoners that he had taken on his predatory incursions into Russian territory. Nasrulla, however, irritated at the neglect to answer his letter to the Queen of England, ordered Colonel Stoddart to be thrown into prison, and after treating him with great cruelty, compelled him to acknowledge the Mohammedan creed. Captain Conolly, who had been with a similar object in Khiva and Khokand, came in 1841 to Bokhara, and after having to submit to the same treatment as Colonel Stoddart, was executed along with him in 1842. Information of their fate was brought to Europe by the missionary Wolff, who had been sent to Bokhara in 1843 for this purpose.

In 1850 the Russians established themselves at the mouth of the Sir (Jaxartes), where it flows into the Sea of Aral, and in 1864 they found it necessary to proceed farther up the river. They made themselves masters of the two towns Turkestan and Aulie-ata, and after bringing them into communication with one another, invested Chemkend, Niazbek and Chinab. The land thus occupied, which up to that time had formed the northern half of the khanate of Khokand, was, along with some other districts that had previously been annexed to Russia, erected into the Russian government of Turkestan, and incorporated with the general government of Orenburg, by the ukase of 14 Feb. (26) 1865. By a subsequent ukase, dated 11 July (23) 1867, this territory was constituted a general government. Soon after the Khan of Khokand invaded the Russian territory, in consequence of which the Russians advanced still farther south and attacked Tashkend, which they took on 28 June 1865. They did not, however, incorporate Tashkend with the Russian territory, but declared it an independent khanate under the protection of Russia. This arrangement was opposed by Muzaffer-Eddin, Emir of Bokhara, whereupon the Russian general Romanovski again assumed the offensive and marching into Bokhara took Khojend by storm on 5 June 1866. In this way Russia came into the possession of the whole basin of the Sir. Not long after Tashkend was incorporated with the Russian territory by the desire of the inhabitants. Meanwhile the war with Bokhara still went on, and peace was not concluded till the beginning of 1867. This peace, however, did not last long. The war was renewed in the spring of the following year, and it was only in July 1868 that the terms of peace between Russia and Bokhara were finally agreed upon. Bokhara was to give up Samarcand and Katti Kurghan, along with the surrounding districts (constituting the tract of land watered by the Zerafshan), and at the same time promised to pay an indemnity to Russia and to protect her trade. Since then the peace has not been broken, but the Emir of Bokhara has sunk more and more into a position of entire dependency on Russia. During the autumn the Russians intervened against the Emir's son, who had risen in revolt against him, and on 12 October in the following year the Emir sent an embassy with presents (tribute) to the Tsar at Saint Petersburg. In the meantime Muzaffer-Eddin had fallen into a dispute with Afghanistan. Shere Ali Khan, of Kabul, had given a favorable reception to the rebellious son of the Emir, and Muzaffer-Eddin, probably in consequence of encouragement from Russia, now thought himself able to make good his former claim to Badakshan and the territory lying about the sources of the Oxus, especially since the Khan of Kabul seemed to have but a slight hold of these parts. He had accordingly already sent out an army with the view of conquering those parts, when, toward the end of 1869, pressure being put upon him by Russia, he concluded a treaty with Kabul by which the Oxus was fixed as the boundary of the coterminous states, and this boundary was afterward recognized by Russia and England. After the Russian expedition to Khiva in 1873 an agreement was made between Russia and Bokhara on 28 September of that year, according to which Bokhara received a portion of the territory that had been ceded by Khiva to Russia, while the Russians received various privileges in return. Muzaffer-Eddin died in 1885, and was succeeded by his son Abdul-Ahad. He abolished slavery in 1886, visited Petrograd seven years later and left there the heir to the throne to be educated along Russian lines. Abdul Ahad died 6 Jan. 1911; his son and successor, Sayid-Mir-Alim Khan (b. 3 Jan. 1880), in April 1917 promised to grant a democratic constitution. No foreigner can enter Bokhara without a Russian passport; the troops, which were formerly ill trained and badly armed, have been drilled by

Russian instructors and armed with rifles. Consult Le Messurier, ‹From London to Bokhara› (1899); O'Donovan, ‹The Merv Oasis› (1880); Curzon, ‹Russia in Central Asia› (1889); Shrine and Ross, ‹The Heart of Asia› (1889); Olafsen, ‹The Emir of Bokhara and His Country› (1911).

BOKHARA, the capital of the khanate of the same name, in lat. 39° 48′ N.; long. 64° 26′ E. It is eight or nine miles in circuit and is surrounded by a mud-wall. It is poorly built, consisting of extremely narrow streets and paltry houses. The principal edifices are the palace of the Khan, crowning a height near the centre of the town and surrounded by a brick wall 70 feet high; and numerous mosques, the largest of which is enameled with tiles of azure blue, and has a tower 210 feet high. A canal crosses the city in many directions. It is spanned at intervals by bridges. Bokhara is a centre of Islam culture and contains about 60 high madrasahs and a great number of lesser ones. The trade was formerly large with India, but has now been almost completely absorbed by Russia. There are several manufacturing establishments producing blades, various metal articles, silks and cloth. The pop. (estimated) 70,000.

BOL, bŏl, **Ferdinand,** Dutch painter: b. Dordrecht 1611; d. Amsterdam 1681. He was the pupil of Rembrandt, and is best known by his admirable portraits, in the style of that master, though he likewise executed several historical paintings of merit. Many of his works are still to be seen at Amsterdam. He also practised etching with success. His best known portrait is that of Saskia, the wife of Rembrandt, now in the Brussels Museum. As a portrait painter he was in great vogue at Amsterdam. His portraits include ‹Regents of the Leper Hospital› (1649), now in the town-hall, Amsterdam; ‹Regents of the Poor House› (1657), in the Rijks Museum; ‹Portrait of Admiral de Ruyter› (1699), also in the Rijks Museum; his religious pictures of note include ‹Repose on the Flight into Egypt› (1644); ‹Joseph Interpreting his Dream›; ‹Women of the Sepulchre.›

BOLAN PASS, a celebrated defile in the Hala Mountains, leading from Sind into Beluchistan. It is about 60 miles long, hemmed in on all sides by lofty precipices, and in parts so narrow that a regiment could defend it against an army. It is traversed by the Bolan River. The crest of the pass is 5,900 feet high. For centuries it was the main route for travelers, invaders and the nomad hordes bent on the invasion of India. A railway through the pass connects with Kandahar.

BOLAS (Sp. *bola,* ball), a form of missile used by the Paraguay Indians, the Patagonians, and especially by the Gauchos of Argentina. It consists of a rope or line having at either end a stone, ball of metal or lump of hardened clay. When used it is swung round the head by one end, and then hurled at an animal so as to entangle its legs and hold it until the hunter comes up.

BOLBEC, bŏl-bĕk, France, town in the department of Seine-Inférieure, 17 miles east-northeast of Havre; agreeably situated on the side of a hill, washed by the Bolbec, which supplies water power for its mills, and at the junction of four valleys. It is a thriving and industrious place, and well situated for commerce. Its printed cottons and handkerchiefs have long been held in high estimation. Besides these it produces linen and woolen stuffs, lace, cotton, velvet and thread, and has several dye works and tanneries, with a considerable trade in grain, horses and cattle. Pop. about 15,000.

BOLDINI, bŏl-dē′nē, **Giovanni,** Italian artist: b. Ferrara 1845. His father was a painter of religious subjects. He studied at the Academy of Florence and for some time in London, and many of his paintings are found in American collections. He was very successful as a portrait painter in London, but removed to Paris in 1872 and has since identified himself with the progressive elements in French artistic circles. He is a chevalier of the Legion of Honor and has received many medals and other awards. His portraits have been especially commended. Among his works are ‹Gossips›; ‹The Connoisseur›; ‹Kitchen Garden›; ‹Spanish Dancer.› In the Luxembourg he is represented by ‹Portrait of a Lady› and ‹Au Luxembourg,› and in the Berlin National Gallery by a portrait of Menzel. In New York he is represented in the Metropolitan Museum by ‹Ladies of the First Empire,› and ‹Des Parisiennes,› and by a portrait of Whistler in the Brooklyn Institute Museum.

BOLDREWOOD, Rolf. See Browne, Thomas Alexander.

BOLE, a term applied to various clay-like substances. They are chiefly hydrous silicates of aluminum and iron. It is of a dull yellow, brownish or red color, feels greasy to the touch and yields to the nail. It has a conchoidal fracture; its streak is shining, and it is opaque or slightly translucent. Bole is found in various localities, such as Armenia, Saxony, Tuscany, South America and the Isle of Skye in Scotland. Bole is used as food by some tribes of South America and the Japanese use it to produce leanness. Armenian bole is a bright red in color and is sometimes used as a dentifrice. It is also used as a tonic and astringent, especially in veterinary practice. Lemnian bole, from the island of Lemnos, when calcined, washed and ground, is applied as a pigment and is variously known as Blois bole, yellow in color; Bohemian bole, which is yellowish red; French bole, pale red, and Silesian bole, pale yellow.

BOLERO, bō-lā′rō, the name given by the Spaniards to a number of their national dances of the ballet class, which in Spain are regularly performed in theatres between the different pieces. They are danced both by men and women, the male dancers who take part in these performances being called boleros, while the females are called boleras. The dances of this class which are best known and most in vogue are known by such names as the Cachuca, Iota aragonesa, Madrileña, Ole, Ialeo de Jerez, etc. They are danced by one or more couples, or, as in the case of the indecent Ole, by a single female dancer. The dancers wear the Andalusian costume, partly because of all the national dresses of Spain this is the richest and most elegant, and partly because the greater number of the boleros are of Andalusian origin. The music for these dances is always played by the orchestra, and is generally marked by rapid changes of time. The melodies are often very beautiful, and are always based upon some of the national airs. The dancers mostly beat time to the music with the castanets (castañuelas). These dances, when the performers are well trained and handsome, have a very powerful effect on the spectators, consisting as they do of graceful attitudes and movements of the body, and being strictly speaking not dances but pantomimes. The dancers endeavor to express by their gestures all the different phases of the passion of love, and this often in a manner which passes far beyond the bounds of modesty. The dances of the common people, on which the boleros are founded, are essentially distinguished from the latter by the fact that the former are accompanied by singing,— partly that of the performers, partly that of the spectators,— while the music is mostly supplied by the guitar, or in some cases by the tambourine. They are very simple, but at the same time very graceful. The dancers beat time with the castanets, as in the boleros properly so called.

BOLESLAS, the name of six kings of Poland and three of Bohemia. The most celebrated of them, Boleslas, surnamed the Great, and the first Polish sovereign who had the title of king, was son of Duke Mietchislaf, and succeeded him in 992. He completed the work of introducing Christianity which his father had begun, contributed greatly to the progress of civilization and brought the army under regular discipline. The Emperor Otho III resolved to ascertain his real character by visiting him in person, and was so much pleased with the deference with which he was received that he crowned him with his own hands in 1001, and exempted him from all homage and tribute. Boleslas assumed all the splendor of his new dignity and became a powerful sovereign. He not only repelled an aggression on his territories by the Duke of Bohemia, but became in his turn the aggressor and conquered Moravia. Success awakened a desire for new conquests, and the Russians, who hitherto had always been the aggressors, were attacked in their turn and were obliged to purchase peace by the cession of large tracts of territory. He afterward turned his arms to the north of Germany and compelled the greater part of the northern sovereigns to become his tributaries. In 1012 a formidable league was formed against him by the Emperor of Germany and the Dukes of Bohemia and Austria, but the allies were glad to conclude a peace with him in 1018. His last campaign was against the Russians, whom he signally defeated in a great battle on the banks of the Bug. After 20 years of continuous warfare he was permitted to enjoy peace and effected numerous internal improvements, promulgating excellent laws, and even putting a check upon his own power by the appointment of a council of 12 to act as mediators between the sovereign and the people. This body was the germ of the Polish Senate. Boleslas died in 1025, after a reign of 26 years, which is one of the most glorious in the annals of Poland, and has handed down his name as one of the greatest sovereigns of his time.

BOLETUS, a genus of fungi of the family *Polyporaceæ*. The greater number of the species are globulous, from which the Italians called them ovoli. The characters of the genus are broad, hemispherical cap, the lower surface formed of open tubes, cylindrical in form, and adhering to one another. The tubes can be separated from the cap, and contain little cylindrical capsules, which are the organs of reproduction. *Boletus edulis* has the stem thick, especially at the base, and marked with red and pale white. The cap is also thick, smooth and fawn-colored. The tubes are very small, rounded and pass from white to a greenish yellow. It grows on the ground abundantly in woods during summer. The flesh is firm and has an agreeable nutty flavor. It is a considerable article of commerce in France, particularly around Bordeaux. It is common in North America. The other species of Boletus are numerous. Most of them are edible but some are believed to be poisonous.

BOLEYN, bŭl'ĕn, **Anne**, Queen of England, one of the wives of Henry VIII: b. 1507; d. 19 May 1536. The name is also spelled Bullen and Bouleyne. Her father, Sir Thomas Boleyn, had been several times sent by Henry as Ambassador to France, and her mother was a daughter of the Duke of Norfolk. At the age of 11 years Anne accompanied to France as maid of honor the Princess Mary of England, betrothed to Louis XII; but when that princess three years later returned to England a widow, Anne did not follow her, but remained at the French court, the freedom and gaiety of which suited her natural disposition, and where she was admired for her beauty and wit. She was attached to the household of Claudia, wife of Francis I, after whose death she was for a time in the service of the Duchess of Alençon, sister of Francis I. Young, gay and witty, she was an object of great attraction in the gallant court of Francis I. She returned to England about 1522, and became lady of honor to Queen Catharine, whom she soon supplanted in the King's affections. The King found an unexpected opposition to his wishes, for Anne firmly declared that she could be had on no terms but those of marriage. She knew that the King already meditated a divorce from his wife, Catharine of Aragon; but she also knew the difficulties that would require to be overcome for the execution of this design, through the opposition of the Church. Cranmer offered his services to bring about the accomplishment of the King's wishes, and thus was given the first occasion for the separation of England from the Roman Church. But the impetuous Henry did not wait for the ministers of his new religion to confirm his divorce; on the contrary, he married Anne in January 1533, having previously created her Marchioness of Pembroke. When her pregnancy revealed the secret, Cranmer declared the first marriage void, and the second valid, and Anne was crowned Queen at Westminster with unparalleled splendor. In 1533 she became the mother of the famous Elizabeth. She could not, however, retain the affections of the King, as inconstant as he was tyrannical; and as she had supplanted her Queen while lady of honor to Catharine, she was now supplanted herself by Jane Seymour, her own lady of honor. Suspicions of infidelity were alleged, which appear to have had no foundation in truth, but were doubtless eagerly laid hold of by Henry as a pretext for his violent proceedings. In 1536 she was accused and brought before a jury of peers. Smeaton, a musician, who was arrested with others, asserted that he had enjoyed the Queen's favors, and on 17 May 1536 she was condemned to death by 26 judges. Anne in vain affirmed that she had long before been contracted to the Duke of Northumberland, and therefore had never been the lawful wife of Henry. Cranmer in vain declared the marriage void. The sentence of death was executed by the command of the inflexible Henry, who esteemed it a great exercise of clemency to substitute the scaffold for the stake. The last day of the life of this unhappy woman, 19 May 1536, presents many interesting moments. She sent for the wife of the lieutenant of the Tower, threw herself upon her knees before her and said, «Go to the Princess Mary (daughter of Catharine) in my name, and in this position beg her forgiveness for all the sufferings I have drawn upon her and her mother.» «She sent her last message to the king,» says Hume, «and acknowledged the obligations which she owed him in uniformly continuing his endeavors for her advancement.» «From a private gentlewoman you have made me first a marchioness, then a queen, and as you can raise me no higher in this world, you are now sending me to be a saint in heaven.» Consult Strickland, 'Queens of England' (Vol. II, 1875–80); Dixon, 'Two Queens' (1873–74); Friedmann, 'Anne Boleyn' (1885).

BOLGRAD, Rumania, town on the river Yalpookh, in the lower Budjak, colonial district of Bessarabia, 162 miles from Odessa and 30 miles from Ismail. It is celebrated for the frequent mention made of it in the discussions relative to the territorial difficulties of Russia with Turkey in the Treaty of Paris of 1856. It trades in grain and produces brick and tallow. Pop. about 13,000, mostly Bulgarians.

BOLINGBROKE, Henry St. John, VISCOUNT, English statesman: b. Battersea in Surrey 1678 (baptized 10 October); d. Battersea, 12 Dec. 1751. He was the son of Sir Henry St. John, afterward Viscount St. John, of Battersea, and Mary, daughter of Robert Rich, Earl of Warwick, thus being (in Goldsmith's words) of a family «of the first rank, equally conspicuous for its antiquity, dignity, and large possessions.» As a child he was brought up in the house of his grandmother, a rigid Presbyterian, where his early and enforced studies of Dr. Manton's famous commentaries are supposed to have «prepared him to become a High Churchman.» However, he went early to Eton, where he completed his education, although it was long asserted that he went to Oxford (Christ Church). About 1698–99 he traveled abroad, and lived generally for a time, with all the avidity of youth and of high spirits, what is called a life of pleasure. He dabbled a little in literature; but his chief ambition seems to have been distinction in dissipation. In 1700 he married Frances Winchescombe, daughter and coheiress of Sir Henry Winchescombe; and entered Parliament for the family borough of Wootton Bassett in Wiltshire. His brilliant oratorical abilities speedily attracted attention; and he eventually cast in his lot with the then dominant Tories, of whom Harley (the speaker) was the leader. In 1702 he received an honorary doctor's degree at Oxford. Two years later, when Harley became Secretary of State, he was made Secretary at War, a post which he retained until February 1708, when upon the accession of the rival Whig party under Marlborough and Godolphin, he and Harley went out together.

For the next two years he led a retired life. But in August 1710 the political whirligig restored the Tories to power with Harley again at their head; and Bolingbroke, sitting in the new Parliament as member for Berkshire, became Secretary of State for Foreign Affairs. In 1712 he was created Viscount Bolingbroke and Baron St. John of Lydiard Tregoze, and he bore a chief part in the «vile Utrecht Treaty,» as Prior calls it, of March 1713. By this time his friendship for his temporizing, sluggish coadjutor had greatly declined; and the last years of their political alliance were years of wrangling hostility, which Swift (the friend of both) strove vainly to mitigate. Then when at last, Bolingbroke had compassed the downfall of Harley, and was intriguing for a Jacobite succession, Queen Anne died suddenly in August 1714, and changed the aspect of affairs.

With the accession of George I, Bolingbroke's power passed away. The new King dismissed him, and after a short time he found it expedient to fly to France. His impeachment and attainder speedily followed. In France, where he remained seven years, he became Secretary of State to the Pretender, by whom also he was eventually dismissed for alleged neglect of duty. In October 1718 his first wife, with whom he had never got on very well, died; and in 1722 he married Marie-Claire Deschamps de Marcilly, widow of the Marquis de Villette, by whose exertions, and interest with King George's mistress, the Duchess of Kendal, he was ultimately allowed to return to England. In 1725 his property was restored, but he could not recover his rights as a peer, and was thus excluded from the House of Lords. At this date he resided at Dawley, near Uxbridge, where he occupied himself in the preparation of philosophical treatises, and of political articles in the *Craftsman*, 1727–34, in opposition to Walpole. In 1735, finding it hopeless to reenter political life, he retired again to France, where he lived at Chantelou in Touraine until his father's death in the spring of 1742. This brought him again to his paternal home at Battersea. Here for nine years longer he for the most part resided until 12 Dec. 1751, when he died of a cancer in the face,— the long torture of which he bore with exemplary fortitude. His second wife, to whom he was tenderly attached, had died in the previous year. Both were buried at Battersea, where there is a monument to them in the parish church, with medallions by Roubillac.

Bolingbroke's biographers have dwelt effectively upon his personal advantages, his handsome presence, his mingled dignity and sweetness, his vivacity, his wit, his marvelous memory and his quickness of apprehension. «His mind,» said Swift, who loved him, «was adorned with the choicest gifts that God has yet thought fit to bestow upon the children of men,» and he refers especially to his «clear judgment,» «his most agreeable elocution» and his «invincible eloquence.» Of his eloquence, whether in speech or script, there is no doubt, and writer after writer has spoken to its seductive charm. His patriotism, upon which he himself insisted, has also found sturdy advocates. But in the main he is now regarded rather as a brilliant and meteoric intriguer than a really great statesman with honest convictions; while his boasted philosophy and his learning are held to be equally unsound and superficial. Pope, his pupil, in the ‹Essay on Man,› is the accredited mouthpiece of his religious opinions; and it is a current criticism of Pope's cleverly executed thesis that it is an exposition of undeveloped doctrine by a disciple to whom it was unintelligible.

Apart from Bolingbroke's political tracts and contributions to the *Craftsman,* the bulk of his writings were published posthumously. The Letters on the ‹Spirit of Patriotism,› and the ‹Idea of a Patriot King› appeared in 1752 and 1749; the ‹Letters on the Study of History› in 1752; and the ‹Letter to Sir William Windham,› a vindication of his conduct up to 1716, generally regarded as his best work, in 1753. In 1754 his dependent, David Mallet, published his ‹Philosophical Writings› in five volumes. It was this publication which gave rise to the celebrated utterance ascribed to Dr. Johnson about the «beggarly Scotchman,» who was paid to let off Bolingbroke's blunderbuss against religion and morality after his death. But Johnson told Boswell that he had «never read Bolingbroke's impiety.»

Bibliography.— Bolingbroke's ‹Life› has been written by Mallet (see above); Macknight (1863); Harrop (1884); Hassall (1889) and latterly (exhaustively and appreciatively) by Walter Sichel (1901–02). Consult also ‹Bolingbroke, a Historical Study,› by Churton Collins (1886).

AUSTIN DOBSON,
Author of ‹Life of Goldsmith,› ‹Life of Richardson,› etc.

BOLÍVAR, Colombia, a northern department of that republic, bordering the Caribbean Sea; area, 23,938 square miles. It is bounded on the north by the department of Atlantico and the Caribbean Sea, on the east by the Magdalena River and department, on the south and southwest by Antioquia. The land is lowlying, except in that part which forms a wedge extending southward into Antioquia; the climate is tropical; much attention is now being paid to agriculture, including the breeding of cattle, horses, etc.; and 10 gold mines are being worked. The provinces are Cartagena, Carmen, Corozal, Chinu, Sincelejo, Sinu, Mompós, Manangué; and we note particularly the islands of San André de Providencia and Providencia. Pop. 421,000.

BOLÍVAR, Ecuador, a province of that republic, bounded on the north by León, on the east by Chimborazo (prov.), on the south by Guayas and on the west by Los Ríos. It embraces the cantones of Guaranda (the capital), Chimbo and San Miguel. The products, beside Peruvian bark and salt, are chiefly those of agriculture and cattle-raising. Pop. 65,000.

BOLÍVAR, Mo., city and county-seat of Polk County, 40 miles north of Springfield, on the Saint Louis and San Francisco Railroad. The Southwest Baptist College is located here. The city has a large trade in apples, eggs, cattle, horses, mules and poultry. Bolivar was settled in 1835 and was incorporated 20 years later. The city owns and operates the electric and water plants. Its government is vested in a mayor and city council, the former being elected for a term of two years. Pop. 1,975.

BOLÍVAR, Venezuela, a state of that republic, with an area estimated at 88,700 square miles. Its capital is Cuidad Bolívar. The districts and their capitals are Cedeño, capital Caicara; Heres, capital Cuidad Bolívar; Independencia, capital Soledad; Miranda, capital Pariaguan; Sotillo, capital Uracoa; Sucre, capital Moitaco; Tadeo Monagas, capital Arivi. Pop. between 55,000 and 56,000.

BOLÍVAR Y PONTE, bō-lē'vär, **Simon,** South American liberator: b. Caracas, 24 July 1783; d. San Pedro Alejandrino, 10 Dec. 1830. He was educated in Spain and when but 18 years old married in Madrid. His wife died soon afterward. The sources of the inspiration of his life's work were: (1) The spectacle of the French Revolution; (2) the example of the United States, which country he visited in 1809; (3) the personality of General Miranda, the leader of the revolutionary movement in Venezuela, who had openly and vigorously attacked Spain's colonial government. Bolívar offered his services to the revolutionary junta a year before Venezuela declared its independence, which was on 5 July 1811.

The revolutionists being at first overwhelmed by the Spanish forces, Bolívar fled to Curaçao. In September 1812 he was at Cartagena; next, we see him scoring against the Spaniards in New Granada; then marching back into Venezuela with only 500 men, but winning so many recruits among the inhabitants that he could meet and defeat General Monteverde at Lastoguanes. He entered Caracas in triumph, 4 Aug. 1813, but suffered defeat in July 1814, and Caracas was again a Spanish town. He then went back to New Granada, succeeding at Bogotá; failing at Santa Marta; resigning his commission and sailing for Kingston, Jamaica, in May 1814. Next, from Aux Cayes, Haiti, he set out with a little force that President Petion equipped; but this expedition, landing in Venezuela in May 1816, was a failure. Again reinforced at Aux Cayes, he landed (December 1816) in Margarita, and (16 Feb. 1817) at Barcelona, for a three days' battle with General Morillo. The latter was defeated. Bolívar was made commander-in-chief, with headquarters at Angostura. Offering to resign his command to a migratory Congress (15 Feb. 1819), he was urged to continue the war; reorganized the army; crossed the Cordilleras; joined forces with Santander, republican leader in New Granada; caught the Spaniards unawares; entered Tunja July 1819, and on 7 August won the battle of Boyacá. On 17 Dec. 1819 Venezuela and New Granada were merged in the new republic of Colombia, which included both and absorbed Ecuador after the victory in Bomboná — the union continuing until the close of 1830. Spain made another effort, sending General Torre to take command of her forces; but Torre was defeated on the field of

Carabobo, in the central part of Venezuela, 25 June 1821. The Constitution of Colombia was adopted, 30 Aug. 1821, and its government inaugurated with Bolívar as President and Gen. Francisco de Paula Santander as Vice-President.

But in that great region lying south of Colombia and north of Chile and Argentina Spain was still strong. At the request of the Congress of Peru, Bolívar sent reinforcements under the command of Gen. Antonio José de Sucre, and went in person to the scene of action. Quito was occupied in June 1822; next, the Liberator assumed the presidency at Lima; on 6 Aug. 1824 he triumphed at Junin. Before the end of that year Sucre gave the *coup de grace* to Spain's colonial system on the mainland (though at widely separated points hopeless resistance was offered a little longer), by capturing Viceroy Laserna, General-in-Chief Aymeric and other Spanish commanders and officers (see Ayacucho). In June 1825 Bolívar visited upper Peru, a region of vast extent, which, in his honor, received the name Bolivia (q.v.) when it was organized as a separate republic. In December 1826, returning to Venezuela (where Gen. José Antonio Paez and Admiral José Padilla had destroyed the remnants of Spanish power on the northern coast), he was re-elected to the presidency, though manifesting great reluctance to retain an office the powers of which were wholly inadequate to the task of holding together in a permanent union three states such as Venezuela, New Granada and Ecuador. Then two important steps were taken: (1) Leaders of the people assured him that he alone could avert disaster and disruption; (2) he himself assumed and attempted to exercise such powers as, in his opinion, were necessary to control the situation. At the height of his fame and strength (for he was in his 47th year), on the eve, however, of a great failure, — for the tendency to disunion in the country freed and consolidated by him had grown beyond control,— Bolívar resigned his command and died. He is often called the Washington of South America. The Congress of Colombia caused his ashes to be removed in 1842 to Caracas, where a monument was erected in his honor. Bogotá erected a statue of him in 1846, and Peru an equestrian statue at Lima in 1858. A statue of Bolívar was erected in Central Park, New York, in 1884. Consult Ducoudrey-Holstein, ‘Mémoires de S. Bolívar’ (London 1830); Mancini, Jules, ‘Bolívar et l'émancipation des colonies espagnoles des origines à 1815’ (Paris 1912); Villanueva, Carlos A., ‘Bolivar y el general San Martín’ (ib. 1911); ‘Cartas de Bolívar’ (1799–1822), with notes by R. Blanco-Fombona and prologue by José Enrique Rodo (ib. 1913); also official documents connected with the career of Bolívar issued in 22 volumes by the Venezuelan government (1826–33) and his correspondence (2 vols., New York 1865).

Marrion Wilcox.

BOLIVIA, bō-lēv'ēä. **Topography and Climate.**— Bolivia, an inland republic of South America, is bounded on the north and east by Brazil, northwest by Peru, southwest by Chile, south by Argentina and Paraguay. It extends from north to south between lat. 10° 20′ S. and 22° 50′ S. and from east to west between long. 57° 47′ 40″ W. (Compare treaty with Brazil 17 Nov. 1903) and about 72° W. According to Bolivian claims, asserted in 1916, the limits should be stated as follows: Long. 57° 29′ 40″ W. and 69° 33′ 35″ W., and, on the eastern side, lat. 9° 34′ 50″ to 25° 13′ S. and, on the western side, lat. 10° 56′ 40″ S. to 25° 00′ 5″ S. Area, exclusive of contested claims, estimated at 560,000 square miles; but, including the Bolivian claims, it is officially stated to be 597,460 or 708,195 square miles.

The principal centres of population are now located in the mountainous region of the western half of the country. The eastern districts, stretching away from the slopes of the Cordillera far into the torrid interior of the continent, are but sparsely settled. Running southeast through the departments of La Paz, Cochabamba and Potosí is the principal range of the Andes Mountains, called the Cordillera Real. Here are the rich mineral districts of Bolivia: the Cerro Rico de Potosí alone has produced up to the present time about $2,000,000,000 worth of silver. Here are some of the highest mountains of America and one of the greatest continuous snow-ranges in the world, having an altitude of 20,000 feet, with the superb peaks of Illimani, Sorata and Illampu lifted two or three thousand feet still higher above their gigantic associates. (Consult Conway, W. M., ‘The Bolivian Andes,’ New York and London 1901). The western range of the Andes continues in a line parallel with the Pacific coast, rejoining the Cordillera Real near Bolivia's southern boundary. Between these two ranges are the high plains, 12,000 to 13,000 feet, and Lake Titicaca, 12,488 feet above the sea-level. This great sheet of water, 120 miles long and from 30 to 50 miles wide, has an average depth of 100 fathoms. Lying southeast of Lake Titicaca are the two most famous cities of the republic, La Paz and Sucre. Three lines of railway connect the former and the principal cities of the high plateaus with the Pacific ports Mollendo, Arica and Antofagasta.

The many different altitudes in Bolivia make it possible for the settler to choose his own climate. The tropical lowlands are practically the only section at all unhealthful. Residents of the upper plateau regions who are unaccustomed to such high altitudes are in the habit of spending a part of each year on the coast. In the region 10,000 to 13,000 feet above sea-level the temperature ranges from 44° to 73° F. Below this, from 7,500 to 10,000, is a temperate region much like the valley of Mexico, with occasional frosts in winter and no extreme heat in summer. From 5,000 to 7,500 is the warmer temperate region of the uplands, and below this begins the hot country, which becomes gradually warmer as the real low-lying tropical lands of the coast are approached.

In the valleys known as Yungas, and in the regions of the plains and forests of the north and northeast, the cold of winter is unknown. This, roughly speaking, is true of the entire eastern region which is divided into watersheds — that of the Amazon basin and that of the Rio de la Plata-Paraná-Paraguay river-system. In the latter are the Pilcomayo, the

Bermejo, etc.; in the former the Beni, the Guaporé or Itinez and the Mamoré — three great rivers forming, in the main, the Rio Madeira. There are only two seasons in these parts: the summer, or rainy season, lasting from December to May, and the winter, or dry season, lasting from June to November. But on the high table-land are four seasons — spring, which begins in August and ends in October, and is characterized by gales of wind with moderate temperature; summer (November-February), at first dry and hot, but, in the second period, rainy; autumn, the season of gentle heat, and here a brief season, extending over the months of March and April only; winter, including the months of May, June and July, the season of low temperatures, icy winds and snow. In these highlands, as at equal altitudes in other parts of the world, a traveler must make preparation, by physical training, to resist the attack of soroche (the local name for mountain-sickness), caused by the diminution of oxygen in the air.

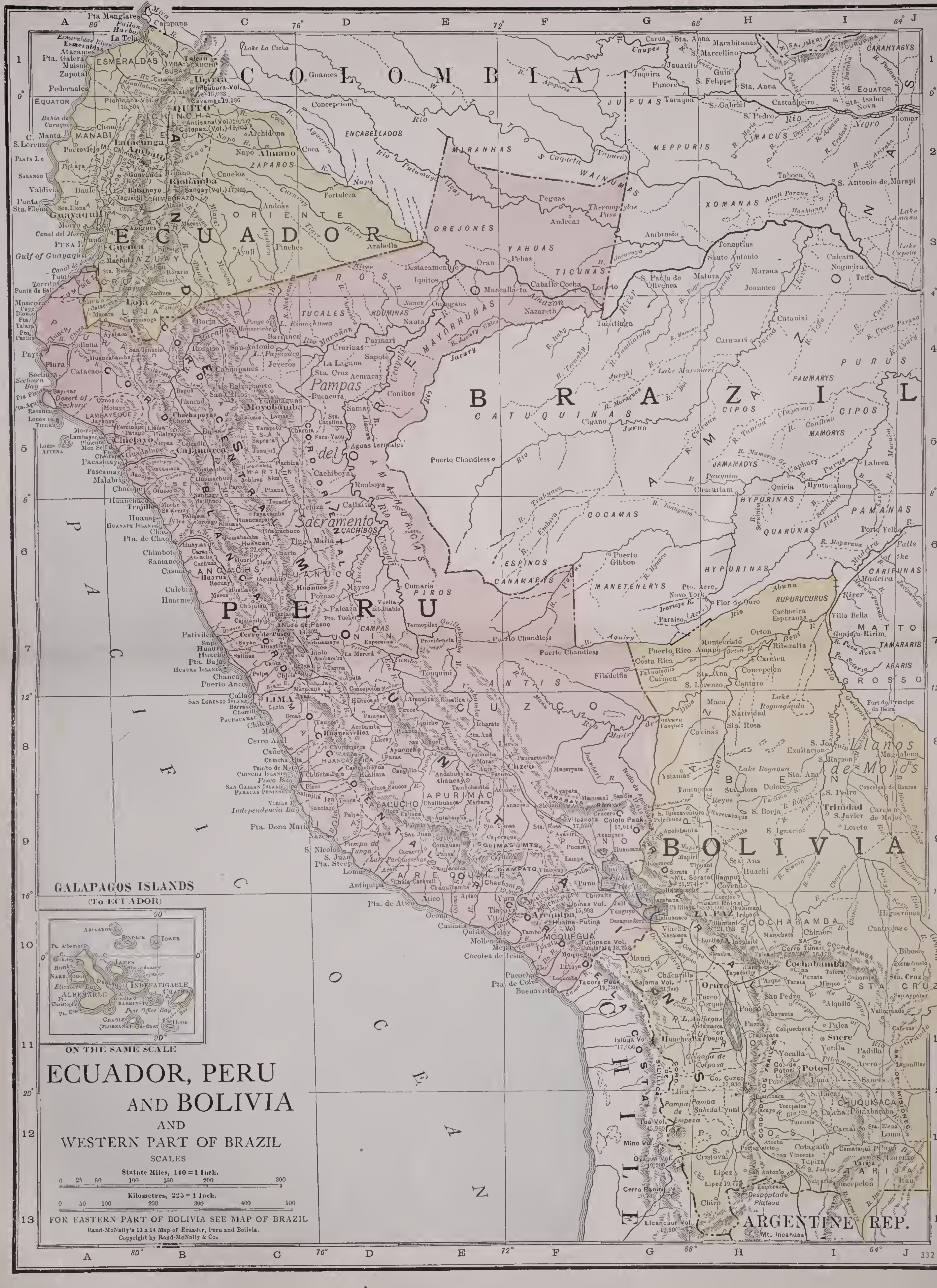
Political Divisions and Population.— The following are the political divisions of Bolivia, with the census of 1910; and the estimated census of 1915, the latter of which has been made up by returns from the state governments:

	1910	1915
La Paz	517,316	726,357
Cochabamba	366,395	534,901
Potosí	395,738	530,748
Santa-Cruz	210,000	341,640
Chuquisaca	240,720	333,226
Tarija	102,887	164,704
Oruro	160,000	140,891
El Bení	35,816	52,450
El Chaco	....	13,085
Colonial territories	....	51,968
Total	2,028,872	2,889,970

There has been no official census taken of the whole of the republic for years as the population of many parts of the country has to be estimated in any census taken, whether by the Federal government or by the states separately. Fully 50 per cent of the population is Indian and from 10 to 15 per cent whites, the rest being mestizos. Of this population over 85 per cent lives on the highlands, where are situated all the larger cities and the Federal capital of the republic, La Paz (100,000 inhabitants). The only city of any importance situated out of the highlands is Santa Cruz de la Sierra (20,000). Cochabamba has 45,000 and Potosí, Oruro and Sucre, all state capitals, on the uplands, are also all very nearly equal in population, ranging between 23,000 and 30,000. The other cities and towns of the republic are of relatively small importance, though as trade distributors to the rural villages, ranches and plantations, many of them enter largely into the activities of the nation, whose population is widely spread without proper means of communication. Most of the political divisions have capitals bearing the same names as themselves, the exceptions being: Chuquisaca, Sucre; El Bení, Trinidad; El Chaco, Jacuiba; Colonial Territories, Cobija.

Labor.— One of Bolivia's greatest needs is labor for the development of her mines, her agriculture and her other industries. Owing to the condition of the Indian throughout the country, wages are low and there are little or no inducements offered to foreign labor. Owing to the great extremes of altitude in the country the hot-land Indians cannot well be used for mining on the uplands and vice-versa. Hence the government has, for several years, been making efforts to tap, with roads and railways, the mid-region from which labor may be brought to the uplands or down to the lowlands. It is also hoped that the extension of railway communication with neighboring countries may result in a supply of upland Indians from outside the republic. At the rate at which Bolivian mining and industries were pushed from 1910 to 1917 this additional supply of labor from some source, whether from the still untapped regions of the republic itself or from without it, became evident in 1916; and the need of additional labor was still greater the following year; for on it depend the continued development of the great mineral resources of the republic.

History.— The country was formed in 1825 from the province of upper Peru, and named in honor of the South American Liberator, Simon Bolívar (q.v.). Partly within Peruvian and partly within Bolivian territory are the waters of Lake Titicaca, on the shores of which we find monuments of semi-civilization antedating the Inca conquest by more than 1,000, perhaps even several thousand, years. From the earliest times, therefore, Peru and Bolivia must have been united in civilization. The Incas of Cuzco overran this district in the 14th century, and 200 years afterward Hernando Pizarro added it to the conquest his brother had made at the heart of the Inca empire. Under the Spaniards, then, it was known as the district or territory of the high court of Charcas, and remained subject to the viceroy of Peru until 1776, when it became a province of the new viceroyalty of Buenos Aires. Before the coming of Pizarro the Sierra supplied a large part of the gold used for the decoration of temples and palaces of the Incas; after the Spanish conquest the natives were driven to work, to continue or increase the output of precious metals for the benefit of masters whose ruthless severity was conspicuous even in that age. There is no entirely trustworthy record of the numbers of those who perished in the mines, but we know that a large Indian population was reduced to its present proportions in the course of two centuries. Taxation was oppressive; provincial governors became monopolists, from whom the natives were obliged to purchase their supplies; here, as elsewhere in America, colonists were forbidden to raise any crops or manufacture any articles which could interfere with the industries of the mother country. Commerce was so strictly limited to Spain that even neighboring colonies were forbidden to have commercial dealings with one another. Toward the end of the 18th century the resentment of the Indians was expressed in several insurrections (1780–82); early in the 19th the provinces of Rio de la Plata and Peru aided the Bolivians in their struggle for independence (July 1809 to August 1825). General Santa Cruz was in command of the expeditions from Lima which failed to drive out the Spanish troops in 1823. But in the following year General Sucre, marching from the same country at the head of an army encouraged by the victory of Ayacucho, was favored by a rising in all the principal towns. By February 1825 La Paz was in the



ON THE SAME SCALE

ECUADOR, PERU AND BOLIVIA AND WESTERN PART OF BRAZIL

SCALES

Statute Miles, 140 = 1 Inch.

Kilometres, 225 = 1 Inch.

FOR EASTERN PART OF BOLIVIA SEE MAP OF BRAZIL

Rand-McNally's 11 x 14 Map of Ecuador, Peru and Bolivia.

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power of the revolutionists, and in March the Spaniards lost their only remaining stronghold, the province of Potosí.

Deputies of the various provinces met at the capital, and before the dissolution of this assembly (6 Oct. 1825) independence was declared. The constitution adopted then (subsequently modified in important respects) was prepared by General Bolívar, and in accord with the views entertained by the great Liberator at this period in his career, when he was master of Colombia and Peru as well, it vested the supreme authority in a President chosen for life. The first incumbent was General Sucre, who accepted the presidency for the space of two years only, and took the further precaution to retain 2,000 Colombian soldiers for his protection. In 1827 he and his Colombians were actually expelled from the country.

Since 1827 Bolivia has had 70 presidents or dictators. In 1828 Santa Cruz came into power and was confronted with a revolution the following year. In 1835, interposing in a quarrel of political factions in Peru, he defeated Gamarra, and named himself protector of that country. Chile refusing to consent to the proposed union of her neighbors, three years of fighting ensued. Santa Cruz was defeated and exiled in 1839, but his party in Bolivia kept up the agitation and finally conferred the presidency upon General Ballivian. Meanwhile Gamarra, who had become President of Peru, tried to annex the department of La Paz. He lost his life in this attempt, and then the Bolivians, in their turn, would have invaded Peru if Chile had not again intervened. Ballivian surrendered his thankless task in 1848. The next President, Belzu, was borne into office on the crest of a wave of revolution; by a revolutionary storm his successor, Córdova, was driven from office and from the land. Linares made himself dictator in 1858, and was deposed in 1861. President Acha, his successor, fell from power when his forces were defeated in battle by his political antagonist, Melgarejo (February 1865). The latter may be characterized as a revolutionist until 1865; president from that time until 1869; dictator from 1869 to 1871. Morales, elected in the year last mentioned, was succeeded in 1873 by President Ballivian, who died after a twelvemonth had passed. Frias, next to take office, was deposed two years later by the troops, who proclaimed General Daza President.

In 1879–83 Bolivia and Peru were at war with Chile, and the defeat of the allies stripped from the weakest of the contestants her only possessions on the Pacific. Bolivia became a landlocked country. The national anger vented itself first upon the President, whom the army had lifted up, and who fled to escape assassination. But Campero, whom Congress chose to carry on the war, and who personally led the Bolivian troops in the field, was wholly unable to oppose Chile's demands alone, and Peru was an ally without power to aid. Bolivia saw herself obliged to acquiesce in an arrangement which some of her leaders hopefully regarded as provisional and temporary. Her bit of coast line and most of the coveted nitrate of soda deposits in the districts of Cobija and Tarapacá,— territory aggregating 70,181 square miles, with about 6,000 inhabitants,— passed into Chile's keeping. (For an account of the War of the Pacific, see CHILE; PERU).

Coincidentally, the failure in 1879–80, after years of effort, to secure the opening of a commercial outlet for Bolivian products to the Atlantic through the Amazon River and its great tributary, the Maderia, was a severe blow. The American contractors for the Madeira and Mamoré Railway of Bolivia and Brazil were deprived of the funds necessary to the prosecution of the enterprise by the withdrawal of the loan that had been placed in England in 1872 for the purpose of constructing this much-needed road. The undertaking was, nevertheless, brought to a successful conclusion 35 years afterward.

The Constitution of 28 Oct. 1880 vested the legislative power in a Senate and House of Representatives, and the executive power in a president elected for four years by direct universal suffrage. But little or no improvement in the political situation was observed. President Campero was succeeded by Gregorio Pacheco, and then came Aniceto Arce (1 Aug. 1888). It was necessary to declare a state of siege in all parts of the republic in the summer of 1890. Attempts were made to overthrow the government, and a number of political leaders were arrested. The election of a successor to President Arce took place 3 May 1892. Violent collisions between the rival factions again compelled the authorities to proclaim a state of siege — which was continued even after the inauguration of the new President, Baptista, on 6 August. Indian revolts also occurred in this year, originating in both the north and the south, and spreading rapidly through the entire country. The barbarous practices of the Indians were, as is usual in this most repulsive species of warfare, matched by the repressive measures of the Bolivian troops.

Chile furnished arms and money to uphold the Baptista government; and the dependence of the country without sea coast upon the country all sea coast for a while was painfully evident. Bolivia had been placed in a position such that any one of her three powerful neighbors,— Chile, Argentina or Brazil,— could win her allegiance by conferring substantial favors, or even by a display of international courtesy. Following Chile's diplomatic overtures, Argentina undertook to open up a way to the sea by a new railroad connecting the Sierra with her river system. Brazil's attitude remained in doubt, until the treaty of 17 Nov. 1903 showed that Acré, competing with Brazil in the production of rubber, was demanded as the price of any concession of a right of way.

When Fernandez Alonzo was elected to the presidency in 1896 his opponents protested that the government had tampered with the returns in such a way as to change the expression of the people's will under the constitutional guarantee of universal suffrage, and an uprising was successful in 1899. The revolutionists, under Col. José Manuel Pando, defeated the government forces in a pitched battle; President Alonzo fled over the Andes into Chile, and reorganization of the government was effected, with Señor Pando at its head. The Pando, Villazon and Montes administrations have devoted themselves to the solution of economic problems, keeping the interests of the country steadily in view and endeavoring with success to stabilize the national policy. Bolivia and Chile signed, in 1904, a treaty of amity that replaced the peace treaty dating from 1884 and removed in large measure Bolivia's fiscal and economic dependence upon Peru and Chile. The French writer, M. P. Walle, says that when President Villazon came into power the country was still suffering from the effects of a long economic crisis, the scarcity of capital being such that the most insignificant transactions were often paralyzed. It was then that Señor Villazon conceived the idea of attracting European capital for the purpose of establishing a great bank, and thereby stimulating the industrial and commercial life of the country. The loan of $7,500,000, which was concluded in 1910 under the auspices of the Crédit Mobilier Français, made it possible to found the Bank of the Bolivian Nation. The results obtained are encouraging: in 1915 and 1916 the bank proved to be a source of strength for the vigorous Montes administration.

Government.— The constitution adopted 28 Oct. 1880 provides for a government embracing a President, two Vice-Presidents, a Cabinet of six ministers, a Senate and a Chamber of Deputies. The President and Vice-Presidents are elected for four years by popular vote. They are not eligible for re-election for the term immediately following. All unmarried males over 22, and married men over 18, who can read and write and own real estate, or have annual income of $40, are entitled to vote. The cabinet is appointed by the President. The Senate consists of 16 members (two from each department) elected for six years, one-third retiring every two years. There are 75 members of the Chamber of Deputies, elected for four years, one-half retiring every two years. The Senate and Chamber meet annually for 60 days, or, when public business requires, for 90 days. During the sessions, senators and deputies receive $200 each month.

Education and Religion.— Education is state-aided, compulsory and gratuitous. Schools are under the control of municipalities, except those, relatively few, which the Church controls. There are universities at La Paz and Sucre, where degrees may be obtained in law, medicine and theology; in the former city, the military academy, a normal school and a faculty of commerce; American institutes, under American professors, at La Paz and Cochabamba; a mining and engineering school at Oruro. In 1915 there were 426 elementary schools with 3,960 teachers and 51,162 pupils. For secondary instruction there were 21 colleges, five clerical institutions and five private lyceos, with 180 teachers and 2,598 pupils. For superior education there were 19 establishments with 78 professors and 1,291 students. At Sucre there is a second normal school for the training of teachers.

According to the constitution, the Roman Catholic Church is recognized by the state, but in practice toleration is extended to other forms of worship.

Agriculture.— Bolivia contains all the natural products of the world. Wheat, meat, fuel, building material, metals for the industries, gold and silver, all are produced within its borders. The climate is such that several crops a year may be obtained with little effort in the warmer parts of the country. Bolivia has a varied flora and fauna. The alimentary plants include wheat, corn, beans, manioc, bananas, potatoes, barley, rice, olives, almonds, peanuts, cocoa, coffee, nutmeg, rubber and cotton. Peruvian bark, palm, cacao, bamboo and vegetable ivory are also plentiful, and balsam, vanilla, copal, tobacco, sugar and sarsaparilla are produced in considerable quantities. The forest growths include acacias, myrtles, mahogany, rosewood, vegetable silk tree, Spanish cedar, lignum vitæ, ebony and other woods suitable for various industries. At the Panama-Pacific Exposition of 1915 Bolivia exhibited more than 1,000 different varieties of woods.

The views of the government of Bolivia on agriculture, as expressed by the Minister of Finance in a formal communication to the Financial Conference held in 1915 at Washington, are these: "It may readily be acknowledged that our agriculture is still in an embryonic state, and that it is being carried on with no other object in view than that of obtaining from nature what she will give readily. This applies not only to foodstuffs and cattle-breeding, but also to the production of rubber by a system that absolutely requires reorganization, with a view to establishing plantations that will in future be capable of competing against the scientifically devised East Indian rubber plantations. The field of arts and manufactures still remains virgin soil. The country may be said to be devoid of manufacturing enterprises in any of the manifold and profitable lines." The government delegate to that conference, Señor Ballivián, writes that all Bolivia's energies have been employed in establishing a "complete railway net of communication and developing her mineral resources. The agricultural products have been insufficient to meet the demand of her domestic consumption." He adds: "Bolivia and Brazil produce the best quality of rubber obtained from the trees of the *Hevea* or *Syphonia Elastica*, known in the market as Pará rubber. But, owing to the foresight and persevering endeavors of the English government to acclimatize those trees in their Asiatic dominions, plantations have spread all through the Orient, causing deadly competition in spite of the superior quality of the South American product. Nevertheless it would be wise for capitalists to undertake similar well-organized plantations in the *habitat* of the rubber tree in Bolivia and Brazil where lands can be easily acquired as well as estates where already exist fully matured rubber trees ready for exploitation. In Bolivia there are new opportunities and inducements for such plantations on account of the recent installation of the railway built with American capital in connection, at Porto Velho, with ocean steamers of 4,000 tons, during four months and of 2,000 tons all the year round." It is true that the vegetation is poor and sickly on the lofty table-lands, but in the valleys which run from the sides of the eastern Cordillera into El Bení, Santa Cruz, Gran Chaco and the National Territory, it is rich and varied, comprising rubber, quinine and other valuable products. The vast eastern plains will be the source of abundant agricultural products when the rivers of the Amazon basin and of the Rio de la Plata watershed can be fully utilized for transportation to the Atlantic.

Cacao and coffee are cultivated in the departments of La Paz and Cochabamba, while other valuable vegetable products are produced in El Bení and Santa Cruz. Coca, from the leaves of which the alkaloid of cocaine is produced, is one of the most valuable products of Bolivia. A large area of the republic is well suited to the cultivation of wheat, but this crop has been studied but little. The government has imported wheat of superior quality from the United States and Argentina for the purpose of supplying a high grade of seed to home growers. Cattle, sheep and llamas are abundant, and the government maintains a veterinary institute and agricultural school.

Nowhere else in Latin America has it been possible to till the soil profitably at such an altitude as in Bolivia, where above the timber limit, at an altitude of 13,000 feet above the sea and over, barley, potatoes and peas are successfully grown; and yet, with all the labor that has been expended in the production of those crops, which are necessarily not of the best, the greater part of the food supply of these high regions must come from the lands below them as it has done for ages. The potatoes grown by the Indians on and above the timber line are dried and kept in this condition for years, thus forming a staple article of food.

The eastern slopes of the Andes of eastern and southern Bolivia have great stretches of rolling land well adapted to grazing and agriculture, while in Santa Cruz and the other provinces great prairie lands afford pasturage of excellent quality for vast herds of cattle yet to come into them; for the territory of Bolivia, after extending over many miles of the Andean Plateau from Lake Titicaca southward, drops down the eastern Cordilleras and spreads over the foothills into the very extensive tropical lowlands of the upper Amazon and river Plate country. So far are some of these lands from the centre of activity of the country that they have found an outlet for their crops through the neighboring countries rather than through Bolivia. It is the hope of the government that the new railway lines being built will bring a part, if not all, of this rich agricultural and mining region into touch with the life of the republic.

For some years past the alpaca wool industry, which has been receiving encouragement from the Bolivian government, has been growing steadily and promises to become one of the important industries of the country. Alpaca wool, the production of which is limited to the Andean highlands of Peru and Bolivia, is adapted to the weaving of a great variety of materials, so the demand for it has become greater from year to year. This has led to an attempt on the part of the Bolivian government to improve the animals and to increase the output of the wool, of which there was exported in 1915 more than $1,000,000 worth from Bolivia alone.

Commerce.— Previous to the outbreak of the European War a curious trade condition existed in Bolivia. For years Great Britain bought by far the greater part of Bolivian exports, especially rubber and tin, while at the same time Germany, through her thoroughly organized commercial system, sold more goods to Bolivia than did all other countries combined. But the advent of the war upset all the old conditions and, eliminating Germany from the field and bringing the United States and neighboring Latin American nations into it with ever-increasing intensity from year to year, changed the whole aspect and direction of Bolivia's trade and quickened it with a new life. Great Britain alone of the European nations kept a fair share of her old trade with Bolivia. During the first quarter of 1916 the foreign trade of Bolivia showed signs of a very considerable revival, the exports being $16,071,400 and the imports $3,203,400 (only two months for the port of Cobija), a total of $19,274,800, as against $11,522,464 for the same period in 1915. The duties collected during the first four months of 1916 were almost $1,000,000 more than for the corresponding period of 1915. In 1917 a commission was appointed to revise a revision of the Bolivian commercial code with a view to making it modern and suitable to the needs of the growing importance of the republic and its rapidly extending relationship with foreign nations. The exports of Bolivia that found their way to Great Britain previous to the outbreak of the war amounted to over 80 per cent of the total exports; while at this same period only about ⅔ of 1 per cent of Bolivian exports went to the United States ($223,791 in 1913). The following year the United States' bill for exports from Bolivia was $981,000 and in 1915 it had reached $10,007,240 out of a total of $38,084,140, of which $36,094,446 was derived from minerals, the largest item of which was tin to the amount of 39,312 metric tons, of which 35,360 metric tons were sold to Great Britain, notwithstanding the war, while the United States took only 1,100 tons. In 1916, however, the United States took a much larger proportion of Bolivian tin and in 1917 about evenly divided this trade with Great Britain. The following table shows the principal Bolivian mineral exports in 1914 and 1915:

	1915		1914	
Minerals	Metric tons	Value	Metric tons	Value
Antimony.....	13,085	$4,216,050	186	$11,909
Bismuth......	568	1,071,125	437	924,649
Copper.......	17,872	3,820,821	3,874	921,659
Rubber.......	5,486	4,521,032	4,485	3,221,063
Silver........	77	1,092,647	72	984,686
Tin..........	39,312	19,268,862	37,259	16,524,656
Wolfram......	499	293,462	276	166,608

Bolivia's imports in cotton goods were valued in 1915 at about $1,000,000 a year. The growth of Bolivian trade shows an increase of over 300 per cent from 1905 to 1915.

Of the total of 5,081 tons of Bolivian rubber exported in 1915, practically all (4,645 tons) found its way to the United States. General increases were also recorded in all other articles of export in 1915. On 30 Nov. 1911 the government made free the importation of cattle during a period of five years, with a view to encouraging breeding to good stock. Exports of hides were 613 tons in 1915 as against 374 in 1914; and the increase in 1916 was still proportionately greater. Coffee exportation increased from 38 tons in 1914 to 105 tons in 1915; coca from 348,000 kilos in 1914 to 389,000 kilos in 1915, of which 305,000 kilos went to Argentina and 771 kilos to the United States. The shipment of cinchona bark almost doubled in 1915 over that of the preceding year (84 tons to 46 tons).

The Bolivian market is difficult to cater to, because the demand for most classes of manufactured goods is limited, the country difficult to travel through and the expenses relatively heavy. The municipalities are accustomed to tax heavily, by means of a licensing system, all traveling salesmen. So most salesmen in Bolivia carry a relatively large line of goods in order that the small sales in each line may sum up a respectable total.

The imports of Bolivia in 1914 were, in part: Live animals, $765,170; food and beverages, $3,803,257; raw material and articles partially manufactured, $2,097,134; manufactured goods, $8,106,928; gold and silver bullion and coins, $1,250,000; total, $15,904,489. Bolivia is becoming an increasingly good market for United States flour, lard, other slightly manufactured foods and canned foods.

In 1915 about two-thirds of the exports of crude rubber were diverted from Liverpool to New York. A very considerable part of the Bolivian rubber which reached the United States was credited not to its original source but to the final port of shipment in South America. Thus all the Bolivian rubber finding its outlet through Atlantic seaports and through countries other than Bolivia herself lost its individuality before reaching its final destination.

While the United States has been taking by far the largest part of the exports of Bolivia, she has not followed this advantage up and secured the import trade which ought to go to the country taking the raw products. After the Germans withdrew in 1914 there was no organized attempt to get their trade, which was worth $8,000,000 annually.

Bolivia issues an official commercial code (‘Código de Comercio’) and a ‘Reglamento General de Aduanas’ (‘Customs House Regulations’), which furnish information invaluable to the house doing business with the country and to the commercial traveler entering Bolivian territory. The increase in the national revenues during the same decade was 230 per cent. Valuable information in regard to foreign commerce will be found in ‘Exporting to Latin America,’ by E. B. Filsinger (New York 1916) and ‘Proceedings of the First Pan American Financial Conference’ (Washington 1915).

Mining.—Tungsten ores averaging 70 per cent sold in La Paz for 600 bolivianos ($233.58 at normal exchange) per quintal of 100 pounds; and vanadium and molybdenum are added to the list of mineral assets. In the ‘Monografia de la Industria Minera,’ which President Villazon caused to be published, there were registered, besides enormous tracts of argentiferous deposits, tin mines numbering 126; copper, 42; gold, 72; wolfram, 16; and bismuth, 3. The future prosperity of Bolivia depends upon capital and ample facilities for smelting (especially the tin ores) near the mines. Oruro is the centre of the mining industry. Lack of water power and inadequate transportation facilities are the chief factors hindering development on a larger scale. Many mines send their products to the nearest railways by llamas, which carry but 100 pounds and can be successfully handled only by Indians. A few mines have hydro-electric plants. Oil fields near Santa Cruz are being worked at a profit by the Sociedad Petrolifera de Bolivia, a corporation controlled largely by Chilean capital.

Bolivia is the second largest producer of tin in the world and only a fraction of her tin ores is being worked, and most of the mines that are being exploited lack modern machinery. The steady advance in the price of tin in 1915, 1916 and 1917 tended greatly to increase the output which was considerably larger in the latter two years than in 1915. The law of 17 Jan. 1914 did away with the 25 per cent export duty on non-concentrated copper ores and exportation rose from 4,794 metric tons in 1914 to 17,945 tons in 1915; and this notwithstanding the fact that the concentrated ores' exportation increased from 3,874 metric tons in 1914 to 5,868 tons the following year. Of the 17,945 tons of non-concentrated ores exported in 1915, over 13,777 went to the United States and 4,000 tons to Great Britain, while the concentrated ores were nearly evenly divided between these two countries. The total exportation of 23,813 tons of copper was the largest, up to that date, in the history of Bolivian mining. Tungsten has also shown a steady increase in output. In 1914 the export was 276 tons while in 1915 it was over 792, of which 436 tons went to the United States and 357 tons to Great Britain. In 1914 the exports of antimony from Bolivia were only 186 tons; but this had increased to 17,923 metric tons in 1916, the greater part of which went to Great Britain. The exportation of Bolivian bismuth and lead showed a very considerable increase from year to year from 1914–17. Of the total exportation of 82,459 tons of fine silver exported from Bolivia in 1915, the United States took 47,220 tons and Great Britain 35,182 tons. In the 7 years 1910–17 the output of silver in Bolivia declined 75 per cent. A very considerable decline also took place in exports. Zinc reached its highest output in 1910, when 11,897 metric tons were exported. In 1915 lead exports amounted to only 104 tons. Yet the country is specially rich in zinc deposits. Almost all the minerals exported from Bolivia contain small quantities of gold, yet only 393 pounds of gold were exported from the country in 1915. An export duty of $20 a kilo tends to keep the gold at home.

Bolivian tin carries certain peculiar impurities which have made it very difficult to refine by ordinary methods. The high cost of fuel has rendered impossible smelting at the mines and the tin has been shipped to foreign countries with generally not less than 25 per cent impurities which had to be transported for long distances over land and then by sea. In 1917 the American Smelting and Refining Company announced that it had discovered an electrolytic process for the refining of Bolivian tin. By this method a metal as pure as that produced anywhere can be obtained at or near the mines where there is plenty of water for the production of electric motor power. This promises to give a still greater impetus to the mining of Bolivian tin, which, in 1917, stood second on the list of the world's production of tin. Tin is already the backbone of the industrial life and the system of public finances in Bolivia and the foundation on which all the foreign trade of the country has been developed of late years, and the increased exportation of tin to the United States from 1914 to 1917 is in line with the increasing interest of the latter country in the hermit republic.

Bolivia has already begun the manufacture of shoes by machinery under an almost prohibitive import duty on foreign shoes; but the shoe business is growing rapidly and either more native factories will have to be established or shoes will have to be imported. Consult Pan-American Union; 'Bolivia' (Washington 1916); the Bolivian 'Memorial'; Walle's 'Bolivia.'

Banking and Finance.— The principal banks are: Banco de la Nación Boliviana (already mentioned), Banco Mercantil, Banco Nacional de Bolivia and the Banco Francisco Argandoña. A gold reserve of 40 per cent is required by law. Under an act recently passed relating to the organization of the Bank of the Bolivian Nation, above mentioned, the said bank has been granted the exclusive right to issue notes, the Nacional de Bolivia, Mercantil and Francisco Argandoña banks having been deprived of such right, and directed to redeem the notes issued by them within five terms of six months each, beginning 1 Jan. 1913. The only foreign bank established in Bolivia is the Banco Alemán Transatlantico — the German bank. The annual dividends declared by the banks vary between 10 and 20 per cent. Four institutions doing business in the country confine their operations to loans on real estate, against which they issue mortgage bonds. They are: Crédito Hipotecario de Bolivia, Banco Hipotecario Nacional, Banco Hipotecario Garantizador de Valores and the Banco Hipotecario Mercantil.

All banks are compelled by law to issue half-yearly statements of their profit and loss. The three principal banks, at the close of 1916, showed profits for the six months preceding as follows: Banco de la Nación, $520,025; Banco Nacional, $116,607, and the Banco Argandoña $44,860.

Under a law passed by the Bolivian Congress on 27 Oct. 1916, the banks of Bolivia advanced to the government the sum of £96,500 sterling ($469,600), the amount advanced by each bank being in proportion to its authorized capital. The purpose of this loan was to assist the government to meet its internal obligations, and especially to meet the interest due on its foreign debt. The amount was to be refunded to the banks not later than 31 Dec. 1916. The 31st having been a holiday, 4 Jan. 1917 was the first day upon which payment could be made to the banks. On that day the National Treasury of Bolivia transferred to the credit of the banks the sum of 1,206,250 bolivianos, which was the full amount due. The amounts advanced by the four banks participating in the loan were: Banco de la Nación Boliviana, £45,800 ($222,875); Banco Mercantil, £22,500 ($109,500); Banco Nacional. £18,800 ($91,475); Banco Argandoña, £9,400 ($45,750).

According to a memorial of the Minister of Finance, the public debt of Bolivia on 30 June 1916 totaled 53,211,355 bolivianos ($20,715,180 at exchange of $0.3893)— 36,340,595 bolivianos ($14,147,395) as external debt and 16,870,760 bolivianos ($6,567,785) as internal debt. The foreign debt is made up of the following items: Morgan loan, existing balance, 5,124,929 bolivianos ($1,995,135); French loan of 1910, existing balance, 17,486,750 bolivianos ($6,807,590); French loan of 1913, existing balance, 12,117,250 bolivianos ($4,717,245); value of warrants issued in favor of the bankers of the 1910 loan, 337,500 bolivianos ($131,390); National City Bank loan, 1,274,166 bolivianos ($496,035).

Referring to this last-named obligation, the Minister of Finance gives account of the important operation effected by the government, which, taking advantage of the high rate of international exchange, transferred the National City Bank debt to the Banco de la Nación Boliviana. On 1 June 1916, the latter institution paid the balance due the former, 1,390,000 bolivianos ($541,125), and the government is therefore under obligation to pay the Banco de la Nación the monthly sum of 115,833 bolivianos ($45,095) in currency.

The internal debt on 30 June 1916 comprised the following items: Compensacion Militar Acre y Pacifico, balance of bonds in circulation, 1,902,200 bolivianos ($740,525); Acre indemnity, 177,600 bolivianos ($69,140); internal debt, 1,419,100 bolivianos ($552,455); 1914 bonds, 9,788,000 bolivianos ($3,810,470); gold banking loan, 1,206,250 bolivianos ($469,590); Banco de la Nación, Koening Bros., and other obligations, 1,050,000 bolivianos ($408,765); Banco de la Nación, advances on customs warrants, 1,327,610 bolivianos ($516,840).

The national budget for 1915 estimated the receipts at 16,985,000 bolivianos (say, $6,607,165) and the expenditures at 21,453,938 bolivianos (say, $8,345,271.88). Bolivia is ranked among the gold-standard countries, although no gold has as yet been actually coined. To the theoretical monetary unit, the boliviano, are assigned 100 centavos representing 0.63904 grammes of gold .91666 fine, or say .58579 grammes of fine gold (B12.50 to the £ sterling). Its par value in terms of currency of the United States is $0.3893, and the value therefore of $1.00 United States currency, expressed in terms of Bolivian currency, is Bs 2.5685. The normal rate of exchange in Bolivia for 90-day drafts on London fluctuates around 18½d. per boliviano. This rate declined after 1 Aug. 1915 to 14¾d. per boliviano, with remittances scarce and difficult to procure even on that basis. The quotations in Bolivia for exchange on New York are more or less nominal, even under normal conditions, and vary from Bs 2.60 to Bs 2.80 per $1.00 currency of the United States. Cosby, J. T., 'Latin American Monetary Systems and Exchange Conditions,' New York 1915.

Transportation and Communication.— A plan of railway construction has been adopted, the fundamental object of which is to facilitate traffic toward both the Atlantic and the Pacific by means of branch lines radiating from the principal railway system, the Antofagasta-Oruro-La Paz Railway. The lines from Mollendo and Arica were mentioned above. One of the branch lines, running to Rio Mulato and Potosí, has been inaugurated. The Oruro-Cochabamba branch is designed to furnish an outlet for a department in which the soil is most fertile and the climate commendable. The Bolivian government is active in the construction of railways, the establishment of automobile routes and the building of new trails leading into the vast agricultural regions of eastern Bolivia. The labor supply of Bolivia is limited by the fact that the conditions of life are extremely difficult in the regions where the mining centres are located, due to the high altitude of these regions and to the aridity which characterizes the highlands of Bolivia. The purpose of the government is to afford easy communication with the lowlands of eastern Bolivia, and thus make available a constant and dependable supply of food to the highlands in which the mines are located.

The Atocha-Tupiza section of the Uyuni-Tupiza Railway was all that remained to be constructed in 1917 of the line to connect La Paz with Buenos Aires, of primary importance in the development of commercial, political and social solidarity between these two countries. It is believed that this route will attract a great deal of the business at present enjoyed by the Transandine Railway connecting Buenos Aires with Santiago, the Bolivian route having the advantage of being open throughout the year.

A South American periodical says that the saving in time by the Bolivian route in comparison with the Transandine route would be two or three days during the summer months, that is, from September to March or April; but in winter, when the Transandine road is closed, and mails must go by way of the Strait of Magellan, the saving of time would be about 10 days. It is also believed that this through Bolivian route will become an important rival of the Panama Canal, since it will offer quicker and more direct transportation from Europe to the west coast of South America. The completion of the Madeira-Mamoré Railway promises to be even more important than the other achievements just mentioned, for this line affords an outlet to the Atlantic by way of the Madeira and Amazon rivers for the forest products of an enormous region.

Bolivia forms a part of the Universal Postal Union. All the large towns are served. In the interior the mail is carried by postilions. Capitals of departments and some of the rural centres of population are united by telegraph and have telephone service. There are 317 post offices with 732 officials. In 1914, 5,215,501 pieces of postal matter were handled. The extent of telegraph lines, both public and private, is 4,259 miles, operated by 216 officers. Wireless telegraph stations are authorized at La Paz, Riberalta or Villa Bella, Cobija, Trinidad, Santa Cruz, Puerto Suárez and Gran Chaco.

In 1917 the Bolivian government authorized the contract of two loans of £1,000,000 each for the completion of the Potosí-Sucre and Atocha-Tupiza lines. The first of these is to connect Potosí with the capital, Sucre, and the second to form the last link between La Paz and Buenos Aires. The construction of La Quiaca-Tupiza line was being rapidly pushed in 1917 by French contractors and the government had in hand the funds necessary for its completion, a loan of £1,000,000 having been secured to that end in France in 1913. Another loan of $2,400,000 secured in New York was also being used for the construction of the electric line from La Paz to the Yungas provinces, which are rich in forests and mineral wealth, being the best gold regions of the republic. The Ochabamba-Oruro line, under construction for several years, was finished in 1917. As the plan of the La Paz-Yungas line is to surmount the Cordilleras and tap the tropical regions, the great rubber belt will be given easy connection with the railways and the sea coast. Most of these roads will also be able to supply cheaper timber to the great stretches of timberless uplands where bricks are now being used in many places for mining purposes. Extensive tracts of the best agricultural lands in Bolivia will be opened up, through railway connection, with the outside world, thus making actual out of potential wealth. Yet, notwithstanding all these efforts of the Bolivian government, the vast extent of trackless country comprising the greater part of its territory is still without railways, for the mountainous nature of the country makes their construction very difficult and their maintenance still more so.

Three lines of steamers provided regular passenger and freight service to the ports of Mollendo, Antofagasta and Arica in 1917. These were the Peruvian Steamship and Dock Company, the South American Steamship Company and the Pacific Steam Navigation Company. Numerous tramp steamers also call at these ports. Owing to the steady increase of Bolivian, Peruvian and Chilean trade from 1910–17, a Japanese, a Norwegian and a United States steamship line were being projected for the Pacific coast of South America in 1917. In this latter year W. R. Grace and Company of New York announced that they were about to establish a line of new and fast steamers between New York and Callao, and that they expected to make the trip in 20 days. In 1916 a Japanese steamship line opened up a regular monthly service between Japan and west-coast ports of South America, via San Francisco and several other ports on the Pacific. The establishment of a smelter at Tacoma by the American Smelting and Refining Company called into being shipment facilities for the transportation of ores from South America with return cargoes of goods from the north.

Army.— Military service is compulsory, by the law of 15 Dec. 1915, upon all males between 19 and 50 years of age. About one year is required to be spent in the ranks before reaching the age of 25; from this latter age to 30 the «ordinary reserve» claims the Bolivian, after which he passes to the «extraordinary reserve» for 10 years, spending the last 10 years as a member of the Territorial Guard. The permanent Bolivian army consists of four infantry regiments of 500 men each, one cavalry regiment 500 strong, one mountain artillery regiment (300), one field artillery regiment (300), one of four batteries (Schneider-Canet), one machine-gun regiment (150); a total, including officers and privates, of 4,000. The Bolivian model of the Mauser rifle of 1898 is the arm of the infantry. The «Columnas,» bodies of men of from 100 to 200, guard the chief towns of each department, and these, supplemented by other forces of 300 each for garrisoning the northwest, southwest, north and east, make a very considerable body, which is continually fluctuating but is capable of being expanded to battalions when necessary. The army (active and first reserve, which numbers over 50,000) is trained by European officers.

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MARRION WILCOX.

BOLKHOV, bōl-kōf', Russia, capital of a district of the same name in the government of Orel, on the Nugra, 200 miles from Moscow. It is a very ancient place, and is chiefly built of wood. It has manufactures of leather, glue, soap, etc., and a considerable trade in hemp, hemp-oil and tallow, amounting to more than $800,000 annually. Its harbor is at Krutogorye, a village on the Oka River 12 miles away. Pop. about 27,000.

BOLL (from the Saxon *bolla*, a bowl), an old Scotch measure for corn, varying in different districts and for different articles. A boll of wheat or beans was equal to four bushels, a boll of oats to six bushels. A boll of canvas measures 35 yards. The boll is still used in some parts of Scotland, but is no longer legally recognized. It is also used in the northern counties of England and in the Isle of Man.

BOLL WEEVIL, Mexican. One of the most conspicuous and harmful is the cotton boll weevil, *Anthonomus grandis.* It is about one-fifth of an inch long and may be differentiated from related species by the fact that the tibiæ of the first pair of legs are provided with two small spines. Immediately after transforming from the pupal state the color is reddish but some time after emergence the color becomes considerably darker. The grub-like larvæ are considerably longer than the adults, strongly curved, white with pale yellowish heads. The eggs are deposited in punctures made by means of the beak of the female weevil in the buds (called squares) and bolls. The larvæ devour the interior. Infested squares practically invariably fall to the ground but bolls always remain attached to the plant. In the case of the squares, of course, the fruit is ruined.

Later, as the bolls form, the weevils attack them also and lay eggs in them, and the larvæ develop in the interior just as with the squares. There is a constant succession of generations from early spring until frost, the weevils becoming continually more numerous as well as both the larvæ and pupæ. A single female will lay her eggs for a considerable number of days, so that by July there is an inextricable confusion of generations, and the insect may be found in the field in all stages at the same time. As stated, the bolls do not drop off as the squares do, but gradually become discolored, and by the time the larva becomes full grown generally crack open at the tip. While the square usually contains but a single larva, as many as 12 have been found in a full grown boll. However, the hatching of only a single larva in a boll results in the destruction of the boll to such an extent that the fibre is useless. Where no serious frost occurs in December all, or nearly all, of the insects reach maturity and enter hibernating quarters, although larvæ have been found as late even as January.

The weevil, so far as known, originated somewhere in Central America. In all probability it has been in Mexico for hundreds of years. During the season 1892–93 it crossed over into Texas somewhere near Brownsville, and in 1894 it was noticed in the cotton fields around San Diego, Alice and Beeville. Since that date to the present time it has spread over new territory, averaging annually more than 20,000 square miles. It now infests 9 of the 13 cotton States in an area estimated at 480,940 square miles. In Texas the weevil area is estimated at 182,600 square miles, which is 69 per cent of the total area of the State. In the other States the territory infested is as follows: Louisiana, 40,800 square miles, or 84 per cent of the total area; in Oklahoma, 41,200 square miles, or nearly 59 per cent of the total area; in Mississippi, 46,340 square miles, or 98 per cent of the total area; in Alabama, 49,100 square miles, or 94 per cent of the total area; in Georgia, 44,400 square miles, or 75 per cent of the total area. Besides, it has infested the whole of the cotton producing section of Florida and nearly one-half of the cotton counties of Tennessee. The spread of the weevil into new territory in 1916, estimated at 71,800 square miles, was second only in extent to the infestation of 1915 which was far greater than in any other year of the weevil's history.

The total loss in the production of cotton in the United States caused by the weevil has been estimated as in excess of 10,000,000 bales, which, at a value of only $50 per bale — not counting the seed — represents a loss of $500,000,000. This estimate covers only the loss incurred in area planted to cotton and not the total production due to the pest. In many localities the appearance of the weevil has resulted in the abandonment, at least in part, of cotton growing by many farmers, which indirectly would account for an additional reduction of millions of bales. On account of the destructive effects of the boll weevil many farmers have abandoned entirely any attempt to produce cotton, or have materially reduced the acreage formerly devoted to this crop. This has deprived the majority of farm laborers of employment and resulted in their emigration to other places. In some counties as much as 65 per cent of the adult farm laborers have moved to other sections. It is claimed that because of this condition it would be impossible, even should the boll weevil leave the territory at once, to make a normal crop of cotton for a number of years. As the weevil has now spread eastward almost to the Savannah River, there is little doubt that it will make its appearance in South Carolina in 1918. Efforts to stay the progress of the weevil have been unavailing, but an effective method of mitigating its damage has been perfected. The methods of destroying or controlling recommended by the Department of Agriculture are the removal of the plants from the fields in the fall when there is no prospect of any more fruit being allowed to mature; early planting, the use of early maturing varieties, the application of fertilizers and intensive cultivation. See also Cotton Insects; Weevil.

BOLLAN, William, lawyer: b. England; d. Massachusetts 1776. In 1740 he settled in Boston, Mass., married a daughter of Governor Shirley in 1743, and became advocate-general. In 1745 he was sent to London as the colony's agent, a post of great responsibility and requiring considerable ability in the holder. After three years of negotiating he secured from the English government the repayment of £183,649 advanced by Massachusetts for the Cape Breton expedition. In 1769 he secured and sent over to Massachusetts 33 letters of Governor Bernard and General Gage, denouncing and calumniating the colonists. He wrote a number of political tracts and pamphlets favoring conciliation with the colonists. Among them were ‘The Mutual Interests of Great Britain and the American Colonies Considered’; ‘Continued Corruption of Standing Armies’; ‘The Free Briton's Memorial, in Defense of the Right of Election’; ‘Importance of the Colonies of North America and the Interests of Great Britain with Regard to Them Considered’; ‘Petition to the King in Council, 26 Jan. 1774, with Illustrations Intended to Promote the Harmony of Great Britain and Her Colonies’; ‘The Importance of Cape Breton Illustrated,’ etc.

BOLLANDISTS, a society of Jesuits which published, under the title ‘Acta Sanctorum,’ the well-known collection of the lives of the saints of the Roman Catholic Church. They received this name from John Bolland (died 1665), who edited the first five volumes from materials already accumulated by Heribert Rosweyd, a Flemish Jesuit, whose collections were entrusted to Bolland at his death in 1629. On the abolition of the society of Jesuits in 1773, it was removed to the monastery of Caudenberg, in Brussels. The abolition of the monasteries by Joseph II brought about its dissolution. A new association was formed in 1837 under the patronage of the Belgian government, and by it the publication of the great work was continued.

BOLLER, Alfred Pancoast, American engineer: b. Philadelphia, 23 Feb. 1840; d. 10 Dec. 1912. A graduate of the University of Pennsylvania and of the Rensselaer Polytechnic Institute, he was in practice in New York city for over 50 years as a consulting engineer, especially for bridge construction. Central bridge and viaducts over the Harlem River, New York city, the Duluth and Superior Interstate bridge, the Albany and Greenbush bridge over the Hudson, the Thames River Shore Line bridge at New London, Conn., are the chief of his works, and he also acted as advising engineer to the Wabash Railroad, the New York City and the Brooklyn Rapid Transit Company. He was author of ‘A Practical Treatise on the Construction of Iron Highway Bridges’ (3d ed., 1876), and ‘The Thames River Bridge’ 1890.

BOLLES, bōlz, **Albert Sidney,** American lawyer, financial expert and author: b. Montville, Conn., 8 March 1846. After admission to the Connecticut bar and election 1870 as judge of the Probate Court, he became editor of *The Bulletin* (Norwich), *The Bankers' Magazine,* professor of mercantile law and banking in the University of Pennsylvania, for eight years was chief of the Pennsylvania Bureau of Industrial Statistics, and later lecturer at the University of Pennsylvania and at Haverford College. He is the author of ‘Financial History of the United States from 1774 to 1789’ (1879); id., from 1789 to 1860 (1883); id., from 1860 to 1865 (1886); ‘The Conflict between Labor and Capital’ (1876); ‘Industrial History of the United States’ (1878); ‘Practical Banking’ (1884); ‘The History of Pennsylvania’ (1899); ‘American Finance’ (1901); ‘The Modern Law of Banking’ (2 vols., 1902).

BOLLES, Frank, author: b. Winchester, Mass., 31 Oct. 1856; d. Cambridge, Mass., 10 Jan. 1894. He was graduated at Harvard Law School in 1882, and while there founded and became first president of what is now the Harvard Co-operative Association. He was an associate editor of the Boston *Advertiser* until chosen secretary of Harvard University in 1886. That office he made thoroughly human to the great gain of both students and faculty. He was in the truest sense the students' friend, and he endeared himself to hundreds, especially the diffident ones and those of limited means, by many acts of helpfulness. In a series of judicious and clear pamphlets he set forth the actual working of Harvard, its methods of instruction, the scope of its departments, etc., and did much to correct the impression that it was a rich man's college. He wrote three works of exceptional literary merit: ‘Land of the Lingering Snow,’ sketches written on an abandoned farm in the heart of the White Mountains; ‘At the North of Bear Camp Water’; and ‘From Blomidon to Smoky, and Other Paper.’ In his descriptions of nature and scenery he is absolutely impersonal, and impartial as a scientist; he never moralizes or indulges in sentiment.

BOLLEY, Henry Luke, American botanist and pathologist: b. Manchester, Ind., 1 Feb. 1865. He became instructor and biological assistant in Purdue University, his alma mater, and in 1888–90 was assistant botanist of the Indiana Agricultural Experiment Station. After 1890 he was professor of botany and zoology at the North Dakota Agricultural College and botanist and plant pathologist of the government experiment station, North Dakota. Author of the North Dakota Pure Seed Law of 1908, he became seed commissioner of the State in 1909. His researches into plant diseases, notably potato scab, grain smut and flax wilt, with remedies and preventives, have been of incalculable value to American agriculture.

BOLLMAN, Eric, adventurer: b. Hoya, Hanover, 1769; d. Jamaica, W. I., 9 Dec. 1821. He studied medicine at Göttingen, practised some time in Karlsruhe and was a physician at Paris during the Revolution, accompanied the refugee Count Narbonne to London in 1792. In London he fell in with Lally-Tollendal, who induced him to go to Austria and endeavor to find out where General Lafayette was kept in confinement. To further this end he then established practice in Vienna. Finding it to be Olmütz, he joined an American named Francis K. Huger in rescuing him. Communicating with the prisoner through the prison surgeon, the two fell upon Lafayette's guards while he was taking exercise in a carriage, and succeeded in getting him away on a horse; but he rode in the wrong direction and was recaptured. Bollman escaped to Prussia, but was handed over to the Austrian authorities by whom he was imprisoned nearly a year in Austria, then released on condition of leaving the country. He came to America, was in Philadelpia for years, then joined Burr's conspiracy in 1806 and was his agent in New Orleans; was apprehended and committed for treason in 1807, but discharged for lack of evidence. In 1814 he returned to Europe, finally settling in London. He published 'Paragraphs on Banks' (2d ed., Philadelphia 1811); 'Improved System of Money Concerns of the Union' (1816); 'Strictures on the Theories of M. Ricardo.'

BOLLMAN'S CASE, in United States law. Eric Bollman (q.v.) was committed on probable suspicion of treason, 27 Jan. 1807, by the Circuit Court of the District of Columbia; the Supreme Court was moved for a writ of *habeas corpus ad subjiciendum* (the great writ against illegal confinement) on the marshal to bring him before the court. The questions were whether the court had the initial power to grant such writs, and if so, whether it could grant them against committals by the Circuit Court. John Marshall decided that it had such right both by common law, as the right of any superior court of record to guard the liberty of the citizen, and by express grant from Congress; and that the allegation of treason was immaterial, as the writ would be useless without the power to go behind the lower court's action and decide on the merits. William Johnson dissented. On the marshal's return it was moved that Bollman be discharged, because no place of commission of the treasonable act was cited, and because the evidence was insufficient and the crime even if proved did not amount to treason. It was decided that there must be an actual levying of war, not merely intent to do so, to constitute treason, that the evidence at best did not even prove that, but only a culpable attempt against a power with which the United States was at peace.

BOLLWORM, a southern name for a caterpillar which bores into cotton balls. In the north it is called «corn worm.» See COTTON INSECTS.

BOLO, the national weapon of the Filipinos. The blade is about 18 inches in length by nearly three inches in breadth at its broadest dimension. It tapers from the middle toward the haft as well as toward the point, making it strongly resemble the ancient short sword. It is not double edged, however, but tapers from a thick back to an extremely keen edge. The scabbard of the bolo is made of a native wood with rough outlined designs carved upon it. The whole weapon is much more beautiful in outline and more formidable than the Cuban machete.

BOLO, Paul, or **BOLO PASHA,** French adventurer: b. Marseilles 1871; d. 16 April 1918. After a checkered career which took him to Spain, South America, and again to France, including two marriages and a prison term, he turned up in Switzerland in the beginning of 1915. Here he renewed his acquaintance with the former Khedive of Egypt, Abbas Hilmi, whose financial adviser he had once been and who had conferred the title of «Pasha» upon him. For the next two and a half years Bolo disposed of large sums of money and made frequent trips to Spain, Italy, Switzerland and one — in 1916 — to America. His financial activities meanwhile, had aroused the suspicions of the French authorities and an elaborate investigation was made, which resulted in his arrest in September 1917 on the charge of having received huge sums from German sources with which to corrupt or purchase French newspapers with a view to discourage the prosecution of the war and to inculcate a desire for peace. He was admitted to bail but a close watch was kept on his movements. His re-arrest followed on 29 Sept. 1917 on the presentation of additional evidence — this time by the American authorities, who had been asked by the French government to investigate Bolo's activities during his stay in America in 1916. At the trial, which began in Paris on 4 Feb. 1918, evidence was adduced showing that Bolo had received all told about $8,000,000 from German sources, of which sum 1,000,000 francs ($200,000) had been turned over to Senator Humbert, proprietor of the *Paris Journal,* for an interest in the paper. A feature of the evidence was the telegrams intercepted by the American authorities, in which the former German Ambassador to Washington informed his government of the possibility of influencing France in a pacifist direction with the aid of an important political personage. Monseigneur Bolo, a prelate and elder brother of the accused made an impassioned appeal to the court for the latter's acquittal expressing the conviction that his brother was insane. The trial ended on 14 Feb. 1918, when the jury returned a verdict of guilty, and Bolo was sentenced to death. He was executed at Vincennes. The disclosures of Bolo's activities also brought about the arrest of M. Caillaux, ex-premier of France, and several French editors on charges of treasonable commerce with the enemy.

BOLOGNA, Giovanni di, sculptor and architect: b. Douai, in Flanders, about 1524; d. Florence 1608. At an early age he went to Rome, where he passed two years in studying the masterpieces of art. Going to Florence, he was attracted by the works of Michelangelo, and determined to pass the rest of his life there. He rapidly rose to the foremost rank among sculptors, and few artists were charged with the execution of so many and such important works. His surname of Bologna seems to have been derived from the celebrated fountain in that city, designed by himself, of which the crowning colossal figure of Neptune is one of the wonders of the modern city. His fine statue of Duke Ferdinand is said to have inspired Browning's poem, 'The Statue and the Bust.' Biographies by De Bouchard, 'Jean de Bologne' (Milan 1906); Desjardins, 'Vie et œuvre de Jean Boulogne' (Paris 1901).

BOLOGNA, bō-lō'nya, Italy (anciently Bononia), capital of the province of the same name. It lies at the foot of the Apennines, between the rivers Reno and Savena, 190 miles north-northwest of Rome. Bologna is five or six miles in circumference, and is surrounded by an unfortified wall of brick. It is an archbishopric, and has a tribunal of appeal in the first instance, and of commerce. It has extensive manufactures of silk goods, velvet, artificial flowers, linen, glass, leather and machinery. Good rail communications greatly further the city's trade, which is very large. The town consists of four quarters, the older poorly, and the modern handsomely built. There are colonnades along the sides of the streets affording shade and shelter to the foot-passengers. Bologna was long renowned for its university, founded, according to tradition, by Theodosius the Younger in 425, but more probably not till 1088, which, in the centuries of barbarism, spread the light of knowledge over all Europe. It once had 10,000 students, but the number is now about 1,500 only. Here the famous Irnerius taught the civil law in the 11th century, and students were attracted from every quarter. Several learned ladies have at different times been professors here, such as Laura Bassi, professor of mathematics and natural philosophy, and Matilda Tambroni, professor of Greek, and the predecessor of the famous Cardinal Mezzofanti. The university formerly possessed so much influence, that even the coins of the city bore its motto — *Bononia docet* («Bologna teaches»). The law school enjoyed the greatest fame. Its teachers had the reputation of inculcating principles favorable to despotism, and were consequently rewarded by the favor of the emperors, and of the Italian sovereigns. Every new discovery in science and the arts found a welcome, and here Galvani discovered galvanism (1789). The medical school is celebrated for having introduced the public dissection of human bodies, and the scientific journals prove that the love of investigation is still awake in Bologna. The university, indeed, still enjoys an excellent reputation, and is well provided with scientific collections, the anatomical collection being especially extensive. It possesses in all five faculties. The university library numbers about 170,000 volumes, with 6,000 manuscripts. Since 1803 the university buildings have consisted of what was formerly the Palazzo Cellesi. The original university building now accommodates the public library, of some 200,000 volumes. The city has a picture-gallery (in the Accademia delle Belle Arte) and a museum of archæological and other objects. In the 16th century the famous painters and sculptors, Carracci, Guido Reni, Domenichino and Albani, founded a school, to which their works have given great reputation. There were, even as early as the 12th and 13th centuries, great painters in Bologna. Francesco Francia was famous in the 15th and early part of the 16th century. The city picture-gallery is rich in the works of these and other artists, the gem of the whole being Raphael's Saint Cecilia.

The chief square of the city, Piazza Vittorio Emanuele, formerly the Piazza Maggiore, with the Piazza del Nettuno at right angles, is adorned by several venerable buildings; among them are the Palazzo Communale (or Del Governo), which contains some magnificent halls, adorned with statues and paintings; Palazzo del Podestà (dating from 1201), now the town hall, chiefly remarkable as having been the prison of Enzius, King of Sardinia, and son of the Emperor Frederick II, who was captured and kept here by the Bolognese for more than 20 years, till his death; and the church or basilica of Saint Petronio, with its unfinished front and the meridian of Cassini drawn upon a copper plate in the floor. Among the hundred other churches, the following are distinguished: Saint Pietro (the cathedral), Saint Salvatore, Saint Domenico (containing the tomb of the saint), Saint Giovanni in Monte, Saint Giacomo Maggiore, all possessed of rich treasures of art, and Saint Stephano, consisting of seven different churches, and partly dating from the 10th century. The palaces are numerous, and were formerly enriched with numerous and valuable works of art. Many of these have now disappeared, though frescoes and other internal decorations still remain. The admired fountain of the Piazza del Nettuno is adorned with a Neptune in bronze, by John of Bologna; in the Piazza Vittorio Emanuele is an equestrian statue of Victor Emmanuel II. The leaning towers, Degli Asinelli, and Garisenda, dating from the 12th century, are among the most remarkable objects in Bologna. The former is square and of massive brickwork, built in three portions, and diminishing in diameter to the top. Its height is 321 feet, and its inclination from the perpendicular four feet. The Garisenda is 163 feet high, and inclines about 10 feet. Bologna is famous for macaroni, sausage, liqueurs and preserved fruits. The pilgrimage to the Madonna di S. Luca, whose church is situated at the foot of the Apennines, three miles distant from Bologna, and to which an arcade of 640 arches leads, annually attracts a great number of people from all parts of Italy. This and other places in the environs may be reached by steam tramway.

Bologna was founded by the Etruscans under the name of Felsina, before the foundation of Rome. In 189 B.C. it was made a Roman colony, and called Bononia. On the fall of the Roman empire, it was taken by the Longobards, then it passed into the hands of the Franks, and was made a free city by Charlemagne. In the 12th and 13th centuries it was one of the most flourishing of the Italian republics; but the feuds between the different parties of the nobles disturbed the stable government of the city, and led to its submission to the papal see, and incorporation in the states of the Church, in 1506. Several attempts were made to throw off the papal authority, one of which, in 1831, was for a time successful. In 1849 the Austrians obtained possession of Bologna, and made it the headquarters of their 2d Italian Corps. In 1860 Bologna was by popular vote annexed to the dominions of King Victor Emmanuel. Pop. 172,628.

BOLOGNA, University of. See BOLOGNA.

BOLOGNA PHIAL, a small flask of unannealed glass, which flies into pieces when its surface is scratched by a hard body or a sharpened body dropped into it. It is prepared by the glass-maker as a test of the condition of a pot of metal before he fashions it into bottles or glasses.

BOLOGNA STONE, or **BOLOGNA PHOSPHORUS.** See BARIUM and BARITE.

BOLOGNESE (bō-lō-nyēz) **SCHOOL.** Despite a culture dating from the Etruscan period, and an interest which led Martial to refer to the city in the 1st century B.C. as «Culta Bononia,» we do not find a school of artists at Bologna until late in the Renaissance, and then — as the great eclectics — they are the least significant of the major groups of Italian painters. Before the middle of the 15th century, such men as Nicolá Pisano, Jacopo della Quercia and finally certain Ferrarese artists had been summoned to Bologna when work of importance was to be done. But the influence they had was not sufficient to bring about native production, or rather the Bolognese did not offer the material for the development of great artists. Even the workshops where marqueterie was produced and for which the city was famous were directed by foreigners. Jacopo Raiboldini, called Il Francia (1450–1517), was the first real master of Bolognese painting, the first who extended the art of the city beyond its borders — instead of importing it from without. Francia had many pupils, among them Timoteo Viti, who became the teacher of Raphael. Another Bolognese name connected with that master is Marc-Antonio Raimondi, the engraver. A second Bolognese school was founded by Ludivico-Carracci (1557–1619), his cousin Agostino (1557–1602) and the latter's brother Annibale (1560–1609), the best of the family. This school was a reaction against the Mannerists of the 16th century, which imitated, in a meaningless manner, the form of Michelangelo and Raphael. The Eclectic school of Bologna was the mother of modern schools of design. Its program was to unite the best points of the principal schools of the Italian Renaissance: Michelangelo's form, Titian's color, Correggio's light and shade and Raphael's symmetry and grace. The result of such training was a certain technical skill, but a lack of originality. The school also placed weight upon the study of nature, especially from the nude, but not to the same extent as the Naturalists, by whom it was much influenced. From their school went forth Guido Reni, Domenichino and Guercino. Through them something of the great tradition of Italian painting was carried on when all else in the peninsula, save a few latter-day Venetians, had ceased to live. Color fades with these later men, however, form becomes academic and they mark the end of Italian art. The best modern treatise on the Bolognese schools is «Die Malerschule von Bologna,» in Dohme, 'Kunst und Künstler Italiens' (Vol. III, Leipzig 1879). Consult also Bolognini-Amorini, 'Vite dei pittori ed artefici Bolognesi' (Bologna 1843).

BOLOMETER («ray-measurer»), an instrument invented by S. P. Langley, secretary of the Smithsonian Institution, for detecting and measuring small quantities of radiant heat. It consists essentially of a balanced Wheatstone's bridge, one of whose arms is formed by a thin strip of platinum foil, blackened to facilitate the absorption of heat The bridge being in equilibrium, with no current passing through the galvanometer, a ray of radiant heat falling upon the platinum strip warms it slightly, thereby increasing its electric resistance, destroying the balance of the bridge and causing an electric current to flow through the galvanometer. By comparing the current so produced with that produced by a source of heat, the intensity of the radiation of which is known, an estimate may be formed of the quantity of heat received from the body under investigation. The instrument is so delicate that it can detect a change of temperature, in the platinum strip, amounting to less than the hundredth-thousandth part of a degree, Fahrenheit. Professor Langley considers that it is also capable of measuring small quantities of radiant heat with an error of not more than 1 per cent. Far more accurate results than this, however, have more recently been obtained, particularly by C. V. Boys with the «Radio-micrometer,» and by E. F. Nichols. The device of the former was sufficiently sensitive to measure the light received from a standard candle at a distance of more than a mile, while the latter physicist succeeded in measuring such extraordinarily small amounts of heat as would be received from a standard candle 8 or 10 miles distant. It was by the latter observer that the heat received from certain of the stars was directly measured for the first time.

The bolometer was first devised for the purpose of studying the distribution of heat in the solar spectrum, and it has yielded much valuable information on this subject, especially in the infra-red regions, where Fraunhofer lines exist, although they are invisible to the eye and can only be photographed with difficulty. For more extended descriptions of the instrument, consult 'Proceedings' of the American Academy of Arts and Sciences (1881, Vol. XVI, p. 342); also 'Annals' of the Astrophysical Observatory of the Smithsonian Institution (1900, Vol. I).

BOLOR TAGH, bō-lôr' täg, also **BILAUR,** or **BELUT TAGH,** a mountain range formerly imagined to exist in central Asia between eastern and western Turkestan, as the axis of the continent. At that point, however, there is really a lofty table-land called the Pamir.

BOLSAS, a river of Mexico, which, after flowing west, enters the Pacific Ocean, 225 miles southwest of Mexico City.

BOLSEC, bōl-sĕc, **Jérôme Hermès,** French writer: b. early in the 16th century; d. 1585. He became first a Carmelite monk, but subsequently embraced the doctrines of the Reformation. After retiring to Italy, and becoming resident at Ferrara, he married, began the study of medicine, and afterward set up as a physician near Geneva, where he insinuated himself into the good graces of Calvin. A quarrel afterward took place, occasioned, it is said, by the opposition of Bolsec to the doctrine of predestination. It resulted in his imprisonment and ultimate banishment from Geneva. He was driven later on from Lausanne through the influence of Beza. He latterly returned to France, and having formally abjured Protestantism, settled as a physician in Lyons. He acquired considerable notoriety by the violence of his philippics against Calvin and Beza, in which in the writing of their lives he has raked together and published all sorts of scandal.

BOLSENA, bōl-sā′nạ, Italy, town on the lake of the same name, 56 miles north-northwest of Rome. In the immediate vicinity stood the ancient Volsinium, one of the most powerful of the Etruscan cities. Some remains of its temples, including several granite columns, are still in existence. The lake of Bolsena, which is supposed to fill an ancient crater, exhales a deadly malaria during the summer season. It is about nine miles long, seven miles broad and 285 feet deep. The shores are formed by finely wooded hills, presenting much beautiful scenery; it has two small islands, called Martana and Bisentina, believed once to have been floating. These islands were favorite retreats of the famous pontiff, Leo X. The Gothic Queen, Amalasuntha, was exiled to Martana and afterward murdered there by Theodahad, her husband. The lake discharges its surplus waters into the Mediterranean by the Marta River.

BOLSHEVIKI. See MAXIMALISTS.

BOLSONS, wide flat plains in southwestern United States and in Mexico, which are built in intermontane valleys by the wash from adjacent mountains. There are usually no permanent streams and no drainage to the sea in these arid regions, and all the débris washed down from the heights lodges in the nearest low place. Bolson deposits usually consist of roughly stratified sand, gravel and clay. Sometimes the lowest part of the plain is occupied part of the year by a lake in which mud and salt accumulate. As the lake dries up, broad mud flats are formed which crack into polygonal blocks, as drying goes on. Such lakes are called Playa lakes, and the flats are Playas. They are very common in many parts of the arid west.

BOLSWARD, bōl′svärt, Holland, town in the province of Friesland, 15 miles southwest of Leeuwarden, at the junction of several canals, and intersected by canals crossed by numerous bridges. The parish church is said to be the largest and finest in Friesland. The trade of Bolsward consists chiefly in cattle, cheese and butter. Bricks and pottery are among the chief manufactures of the town, which in the Middle Ages was a member of the Hanseatic League. Pop. 7,500.

BOLSWERT, bŏl′svĕrt, **Boetius Adam**, called Bolswert after his native place in Friesland, Dutch engraver: b. about 1580; d. 1634. He was the author of many valuable engravings after designs of Bloemaert and Rubens. His younger brother, Scheltius Adam, rose to higher fame in the same art, especially distinguishing himself by his prints after some of the best works of Rubens and Vandyke. Both brothers practised their art at Antwerp.

BOLT COURT, an alley in London, off Fleet street, near Saint Bride's Church, in which Cobbett and Dr. Samuel Johnson lived for some years.

BOLT-ROPES, ropes used to strengthen the sails of a ship, the edges of the sails being sewn to them. Those on the sides are called leech-ropes, the others head and foot ropes.

BOLTI, or **BULTÉE**, an edible chichlid fish of the Nile.

BOLTING-CLOTH, a closely woven fabric, generally of silk, used for sifting flour. See FLOUR.

BOLTON, Benjamin Meade, American bacteriolytic specialist: b. Richmond, Va., 7 April 1857. His early studies at the University of Virginia, South Carolina College, were broadened by subsequent courses at Heidelberg, Göttingen and Berlin. He worked as assistant at Johns Hopkins for two years, in 1888 was appointed professor at South Carolina College, in 1889 director of the bacteriological department of Hoagland Laboratory, and in 1892 associate at Johns Hopkins. He became director of the Board of Health, Philadelphia, in 1895, professor at the University of Missouri in 1896, and from 1897 was expert in experimental therapeutics at the Bureau of Animal Industry, Washington. Widely known for his experimental work in bacteriology and medicine, he is author of numerous bulletins of the Department of Agriculture, of ‹The Bacteriolytic Power of the Blood Serum of Hogs› (1907); and ‹Hygienic Water Supplies for Farms› (1908).

BOLTON, Charles Knowles, American poet and miscellaneous writer: b. Cleveland, Ohio, 14 Nov. 1867. He received his education at Harvard from which he was graduated in 1890. In 1884 he was appointed librarian at Brookline and has been librarian of the Boston Athenæum Library from 1898. He is the author of works on library administration, on American collections and American libraries generally. He has written ‹Gossiping Guide to Harvard›; ‹Saskia, the Wife of Rembrandt› (1893); ‹The Wooing of Martha Pitkin› (1894); ‹Love Story of Ursula Wolcott› (1895); ‹The Private Soldier Under Washington› (1902); ‹Brookline, History of a Favored Town› (1897). He edited ‹The Athenæum Centenary› (1907); ‹The American Library History› (1911).

BOLTON, Henry Carrington, American scientific writer: b. New York 1843; d. Washington, D. C., 17 Nov. 1903. He was graduated at Columbia University and studied abroad; became professor of chemistry and natural science at Trinity College, Hartford, Conn. In 1900 he was elected president of the Chemical Society of Washington, D. C. He wrote ‹The Counting-Out Rhymes of Children, a Study in Folk-Lore› (1888); ‹Literature of Manganese›; ‹Students' Guide in Quantitative Analysis›; ‹The Evolution of the Thermometer, 1592–1743› (1900).

BOLTON, Sarah Knowles, American author: b. Farmington, Conn., 15 Sept. 1841; d. Cleveland, Ohio, 21 Feb. 1916. She successively held the positions of associate editor of the *Congregationalist*, assistant corresponding secretary of the National Woman's Christian Temperance Union and vice-president of the American Humane Education Society. She is the author of a number of books, including: ‹Girls Who Became Famous› (1886); ‹Famous

American Authors' (1887); 'Famous American Statesmen' (1888); 'Famous Types of Womanhood' (1892); 'The Inevitable and Other Poems' (1895); 'Our Devoted Friend, the Dog' (1901); 'How Success is Won' (1884); 'Famous Givers and Their Gifts' (1896); 'Memorial Sketch of Charles E. Bolton' (1907), etc.

BOLTON, Sarah Little, American poet: b. Newport, Ky., 18 Dec. 1815; d. Indianapolis, 4 Aug. 1893. She is known for her patriotic and war poems, including 'Paddle Your Own Canoe'; 'Left on the Battlefield,' etc. Her collected 'Poems' appeared in 1865 and 1886.

BOLTON, or **BOLTON-LE-MOORS,** England, manufacturing town of Lancashire, 10 miles northwest from Manchester. It consists mainly of two divisions, Great Bolton and Little Bolton, separated from each other by the river Croal. The older portion of the two contains many narrow and irregular streets, but by far the larger portion of the town is modern. About $2,500,000 has been recently expended in street improvements. The finest of the public edifices is the town hall, in the Grecian style, with a tower 220 feet high, fronting a spacious square, and erected at an expense of about $1,000,000. Among other public buildings are one of the finest market halls in England, costing, with its approaches, nearly $500,000; a church institute; a temperance hall; commodious baths; savings bank; two theatres; two technical schools; a post-office, gas offices, County Court, infirmary and children's hospital; orphanages; Chadwick and Mere Hall museums; board schools; poor-law offices, etc. The religious edifices are numerous, and some of them of fine architectural appearance. Foremost among these is Saint Peter's parish church, a modern cruciform building in the Decorated style, with a tower at the western end 150 feet high. The schools are numerous and well attended, and, under the school board, education is rapidly improving. There is a free grammar school, founded in 1641. The Bolton Free Public libraries (six in number) contain over 93,000 volumes. There are now four parks and three recreation grounds belonging to the town. In manufacturing industry Bolton is surpassed by few places in the kingdom, the cotton manufacture being its staple. It contains some of the largest and finest cotton mills in the world. In the town itself there are some 370 factories, of which nearly 140 are cotton mills and establishments for the weaving of cotton fabrics. The yarns spun in Bolton are generally fine, and a great variety of fancy goods is produced, besides plain calicoes. Bleaching is also carried on to a great extent, there being over 20 bleaching grounds, some of them very large. There are also several large engineering works, iron works, soap factories, employing a great many hands. Besides these there are collieries, paper mills, foundries, chemical works and various other works. Bolton is of considerable antiquity, having been raised to the dignity of a market town in 1256. It returns two members to Parliament. Bolton has a long history as an industrial city. In 1337 Flemish immigrants established woolen manufactures, and in the 17th century the arrival of French Huguenots gave a fresh impetus to this industry. About 1750 velvets were first made here. Arkwright and Crompton, whose inventions revolutionized the textile industry, were natives of Bolton. They met with considerable opposition at first but the results were beneficial to Bolton's preeminence as a centre of the textile industry. Bolton was a pioneer in municipal enterprise, having a municipally owned water plant in 1847. At present the gas works, street railways, electric plant are owned by the city, which also operates markets, ice houses, etc. There is a sewage farm operated for the utilization of the sewage. It was incorporated in 1838, and became a county borough in 1888. Pop. 180,855.

BOLTON ABBEY, a famous English Abbey in Yorkshire, in a highly picturesque district on the river Wharfe, six miles east of Skipton, and 21 miles northwest of Leeds. Founded for Augustinian canons about 1150, it has been celebrated by Wordsworth in 'The White Doe of Rylstone' and 'The Force of Prayer.' The eastern end is a ruin, but the nave is utilized for the purposes of a parish church. It is the property of the Duke of Devonshire, one of whose seats, Bolton Hall, is in the immediate vicinity.

BOLTZMANN, bōlts'män, **Ludwig,** Austrian scientist and physicist: b. Vienna 1844; d. there 1906. He became widely known for his valuable work on physical problems, thermodynamics, the kinetic theory of gases, etc. A student in Vienna, Heidelberg and Berlin, his subsequent appointments were professor of physico-mathematics, University of Gratz 1869; mathematics, Vienna 1873; chair of experimental physics, Gratz 1876; theoretical physics, Munich 1890, Vienna 1895, Leipzig 1900, Vienna again 1902. His published writings include 'Vorlesungen über Maxwell's Theorie der Elektrizität und des Lichts' (2 vols., 1891–93); 'Vorlesungen über Kinetische Gastheorie' (2 vols., 1896–98); 'Vorlesungen über die Prinzipe der Mechanik' (2 vols., 1897–1904); 'Populäre Schriften' (1905).

BOLUWAYO. See BULAWAYO.

BOLYAI, bōl'yō-ē, **Farkas** (German WOLFGANG BOLYAI), a Hungarian mathematician: b. Bólya 1775; d. 1856. He obtained his early education in Enged, Klausenberg and Jena, and for three years (1796–99) studied at Göttingen, where he became intimate with Gauss (q.v.). He later became professor of mathematics at the Reformed College of Maros-Vásárhely, a position which he efficiently held for 47 years. He made several attempts to prove Euclid's postulate of parallelism, but it remained to his son to establish non-Euclidean geometry as a science in its own right. His chief work (published in two volumes in 1832–33) was entitled "*Tentamen juventutem studiosam in elementa matheseos puræ . . . introducendi.*" Over his grave he wished that an apple tree should be planted, to commemorate the three apples — of Eve, of Paris and of Newton.

BOLYAI, János (German JOHANN BOLYAI): b. 1802; d. 1860. A Hungarian mathematician, the son of the above. He was very precocious, and finished the Latin school at the age of 12. He became an officer of engineers, and was distinguished as a mathematician, a violinist and a swordsman. He is famous as one of the discoverers of non-Euclidean geometry, which he treated in a little 26 page appendix to the 'Tentamen' of his father, called 'The Science Absolute of Space' (tr. by G. B. Halsted, Austin, Tex., 1891). His work remained almost unknown until R. Baltzos of Giessen called attention to it in 1867.

BOLZANO, bōl-tsä'-no, **Bernhard**, Bohemian Roman Catholic theologian and philosopher: b. Prague, 5 Oct. 1781; d. 18 Dec. 1848. From 1805 to 1820 he was professor and chaplain at the University of Prague, but was accused of insidiously instilling into the minds of the students the heresies of Schelling and Hegel, and was dismissed from his office. He left many writings, of which his 'Wissenschaftslehre' (1842) is the most important. Consult 'Autobiography' (1875).

BOMA, locally MBOMA, Belgian Kongo, river port, capital of the colony, on the Kongo, 60 miles from its mouth. Dutch, Portuguese, French and British traders established factories here in the 16th and 17th centuries, when it was a commercial centre for the slave trade of the lower Kongo. Its modern development dates from the protectorate established in 1884 by the International Association of the Kongo. Seagoing vessels ascend the river to Boma which has regular steamship communication with Antwerp and a large shipping trade in bananas. The town consists of a residential section containing the government buildings and a business section. An American consul-general has resided here since 1906. Pop. about 5,000.

BOMARSUND, bō'mär-soond, a narrow channel between the islands of Aland and Vardö, at the entrance of the Gulf of Bothnia. The Russian fortifications to the harbor of Bomarsund were destroyed by the British and French fleets during the war of 1854. The channels leading up to Bomarsund were blockaded and the Russian commander, General Bodisco, was compelled to surrender on 16 August, the allies continuing to occupy the island until the end of the month, when the whole of the fortification was blown up. Under the Treaty of Paris (1856) the fortress was not to be rebuilt.

BOMB, a hollow box, basket or shell, filled with gunpowder, or other explosive set off by means of a time-fuse or other device. Formerly the term applied only to the spherical shells thrown by a mortar, but with the use of aircraft in war the missiles dropped from them are called bombs; and the name is also applied to hand grenades and the larger grenades thrown by catapults and trench mortars. The term is also used to designate the infernal machines contrived by common criminals to accomplish murder and destruction of property. The last named are generally an improvised shell of gas or water pipe filled with explosives, and encased in a box so arranged that when the lid is lifted the charge is fired. More elaborate bombs of this sort have clock-work machinery which can be set to fire the bomb at any decided time.

The bombs used by aircraft are of five types: (1) Heavy explosive bombs — for destroying or damaging large structures, like dockyards and ships, munition «dumps,» and factories, railway stations, etc.; (2) hand grenades — for attacking troops in masses, as in camp or on the march; (3) incendiary bombs — for starting fires in oil-yards, storehouses or airship sheds; (4) aerial bombs — which have mechanism to change their direction from vertical to horizontal after they have fallen a short distance — for attacks upon airships and balloons; (5) poison gas bombs — for attack upon trenches and troop masses.

In the British air service the Marten-Hale bombs have been most largely used. They are of two types, shrapnel and high-explosive. The first is loaded with 321 to 340 steel balls, which with the fragments of the encasing shell produce about 1,000 missiles effective over a space about 100 feet square. Its exploding charge is 4 pounds 2½ ounces of trinitrotoluol. The second carries 6 pounds 3¾ ounces of the same explosive, and weighs about 20 pounds in all. It produces an enormous shattering effect if dropped from above 200 feet — a fall of that distance being required to bring the primer (by revolving vanes) within acting distance of the charge. These bombs are pear-shaped, dropping with the large end down. To the upper end is attached a streamer of some textile material which steadies the bomb in falling. In order to overcome the tendency to bury itself in the earth before exploding, when dropped from a great height a small parachute is attached. This is sufficient to modify the speed, and also checks the forward trend imparted by the flying plane, so that it drops almost vertically after release except for the windage. Incendiary bombs, as used by the German air fleet, consist of an outer skin wound about with tarred rope, forming a chamber in which is packed resin, clippings of celluloid and similar combustible material, surrounding a central charge of thermit. An igniter sets off the thermit which burns fiercely. In some of the incendiary bombs dropped in London, which failed to explode, was found amorphous phosphorus, which would not only spread fire, but also produce a cloud of asphyxiating fumes which would prevent the near approach of any one attempting to extinguish the fire.

Poison gas bombs, to be effective in producing either asphyxia or death must necessarily be filled with a gas at least twice as heavy as air, as otherwise the gas would be too quickly diffused into the atmosphere. Chief among the heavy gases is the vapor of bromine, 5.53 times heavier than air. The effect of bromine is to produce at first spasms of the glottis, with asphyxiation rapidly following. It is believed that the asphyxiating bombs in use by the German aircraft in the European War were filled with liquid bromine, which was scattered upon the bursting of the bombs. Other gases which may have been used are phosgene, 3.49 times as heavy as air; nitrogen tetroxide (nitrous acid), 3.17 times as heavy as air, chlorine and sulphur dioxide, respectively 2.45 and 2.21 times heavier than air. The effects of all these gases are the same, with the additional certainty of poisoning of the wound if made with a phosphorus bearing bomb. See AMMUNITION; GRENADE; PROJECTILES.

BOMB LANCE, a harpoon used in whale fishing which carries a charge of explosive material in its head. In one form of the weapon the arrangement is that when the harpoon strikes the fish, the bar, which is pivoted obliquely in the head of the instrument, shall serve to release a spring acting on the hammer, which then explodes the cap and bursts the charge chamber.

BOMBARD. See Bombardment.

BOMBARDIER, originally an artillery soldier whose special duties are connected with the loading and firing of shells, grenades, etc., from bombards, mortars or howitzers. Bombardier is now the special title of a non-commissioned officer in the British artillery ranking with a corporal.

BOMBARDIER-BEETLE, or **ARTILLERY-BEETLE,** an insect of the genus *Brachinus,* and family *Carabidæ.* The head is narrow, the prothorax heart-shaped. While certain other beetles have at the end of the body two glands which secrete a malodorous fluid which they eject as a means of defense against their enemies, in the bombardier-beetle this fluid or spray appears to be charged with a gas, which, on coming in contact with the air, looks like smoke, and is ejected with an explosion like that of a miniature pop-gun. This gas-like vapor and detonation baffles and discomfits the pursuer (most often some other predatory beetle) as if blinding it. When being captured they will fire off this discharge several times. Several of the species (*B. fumans* and allies) are yellowish-red, with bluish and greenish elytra.

BOMBARDMENT, the act of throwing bombs or shells into a town or fortress for incendiary purposes. A bombardment is either desultory, when ships, field batteries or a proportionately small number of siege batteries throw shells into a place in order to intimidate the inhabitants and garrison into a hasty surrender, or for some other purpose; or it is regular, and then forms one of the methods of conducting the attack of a fortified place. The attack by regular bombardment was first introduced by the Prussians in their sieges in 1815, after Waterloo, of the fortresses in the north of France. The army and the Bonapartist party being then much dispirited, and the remainder of the inhabitants anxiously wishing for peace, it was thought that the formalities of the old methodical attack in this case might be dispensed with, and a short and heavy bombardment substituted, which would create fires and explosions of magazines, prevent every soul in the place from getting a night's rest and thus in a short time compel a surrender, either by the moral pressure of the inhabitants on the commander, or by the actual amount of devastation caused, and by outfatiguing the garrison. The regular attack by direct fire against the defenses, though proceeded with, became secondary to vertical fire and shelling from heavy howitzers. In some cases a desultory bombardment was sufficient, in others a regular bombardment had to be resorted to; but in every instance the plan was successful; and it is now a maxim in the theory of sieges, that to destroy the resources, and to render unsafe the interior of a fortress by vertical fire, is as important (if not more so) as the destruction of its outer defenses by direct and ricochet firing. A bombardment will be more effective against a fortress of middling size with numerous non-military inhabitants, the moral effect upon them being one of the means applied to force the commander to surrender. Before bombarding a town, it is customary to give 24 hours' notice thereof, to allow women, children and non-combatants to leave it. Modern bombardments have not usually been particularly destructive. During the siege of Paris, 1870–71, some 500 shells were thrown into the city daily by the Germans, but relatively little mischief was accomplished by them. A similar result was shown at the bombardment of Santiago de Cuba by the American forces in 1898, and also in the long sieges of Ladysmith and Kimberley in 1899–1900. The recent bombardments of the European War have taught various lessons. The German forces reduced the fortresses of Liege, Namur, Maubeuge and Antwerp by furious and sustained bombardments in which fortifications of the most modern kind were rendered untenable and useless; the damage to civilians and the moral effects playing no inconsiderable part in hastening surrender. On the other hand the British and French fleets bombarded the forts of the Dardanelles in an effort to reach Constantinople. While the bombardment was incessant, the deadliest of modern ordnance and explosives being brought into use, but little damage was inflicted and little gained from a military viewpoint, compared to the expenditure of ammunition and the losses inflicted by the fire of the heavy land batteries, five capital ships and many lesser craft being destroyed, and other fleet units seriously damaged.

BOMBARDON, a large brass musical instrument of the sax-horn kind, and the lowest of these instruments. It is made in more than one size, and the largest is generally of circular form and big enough to go around the body of the performer. It is not capable of very rapid execution.

BOMBASTES FURIOSO, a burlesque opera by William Barnes Rhodes, produced in 1790 and intended as a parody of ‘Orlando Furioso.’ Its name is that of the principal personage, a braggart who kills his king, Artaxominous, for a pair of jack-boots.

BOMBAX (Silk Cotton Tree), a genus of 50 tropical trees of the family *Bombacaceæ,* with digitate leaves and large scarlet or white axillary flowers. *B. ceiba,* the five-leaved silk cotton tree, attains a great height in tropical America, where it is native and where its immense trunks are scooped out for canoes. This species, *B. munguba,* a South American species, and *B. malabaricum,* the red silk cotton tree, so named from the color of its «cotton,» bear pods which furnish a fibre useful for stuffing cushions; hence the common name. All the species yield useful bast employed in rope making, and have been suggested as possibly valuable for paper making.

BOMBAY, bŏm-bā′, a province or presidency of British India, stretching along the west side of the peninsula, and bounded on the north by Baluchistan, the Punjab, Rajputana; on the east by the native state of Indore, the Central Provinces, Berar and Haidarabad; on the south by Madras and Mysore; and on the west by the Arabian Sea. Politically the presidency consists of the British districts of Bombay, Sind and Aden, with an area of 123,059 square miles and a population of 19,672,642, and of a number of native states with an area of 63,864 square miles and a population of 7,411,676. Its geographical limits include also the Portuguese settlements of Din, Damaun and Goa, and the important native state of Baroda, under the direct control of the Indian government. Most of the British territory was acquired by annexation from the Mahrattas, and by the lapse of Satara state. Sind was conquered in 1843. The chief cities are Bombay (Pop. 979,445), Poona (Pop. 158,856), Ahmedadad (Pop. 216,777), Surat (Pop. 114,868) and Karachi (Pop. 151,903). The chief spoken languages are Marathi, used by nearly half the population; Gujrathi, used by the commercial classes; Kanarese and Sindhi. About three-fourths of the population profess Hinduism, fully one-fifth are Mohammedans, the rest being Jains, Christians, Sikhs, Parsees, aboriginals, etc.

The chief openings in the coast of Bombay are the gulfs of Cambay and Cutch, separated by the peninsula of Kathiawar. The chief harbors are those of Bombay and Karachi. Physically the presidency consists of five distinct divisions; Sind in the north, flat desert in part, and mostly unproductive when not under irrigation; Gujerat, a fertile alluvial plain, watered by the Taptee and Nerbudda rivers, the most populous region of the province; the Konkan, a mountainous country lying between the Western Ghats and the sea; the Deccan, a plain, without sufficient rainfall and devoid of vegetation during most of the year; finally the highly cultivated Karnatik plain, south of the river Kistna. The chief mountain ranges are the Hala Mountains, west of the Indus, the Western Ghats, running north and south, near the coast, with an average elevation of 1,800 feet and peaks double that height, and the Satpura range, separating the basins of the Nerbudda and the Taptee. The most important rivers are the Indus, Nerbudda and Taptee, all of which flow into the Arabian Sea; the Godavari and Kistna rise on the eastern slopes of the Ghats. Many short torrential rivers traverse the Konkan coastal strip. The forests of Sind consist chiefly of sisu, babul (a kind of acacia), bhan (a species of poplar) and tamarisk; while from the forests of the western slopes of the Ghats are obtained teak, blackwood, ebony, ironwood, babul, sandalwood and other valuable timbers. The cocoanut and date palms, mango, jack, betel-nut, and myrobalans are other important indigenous vegetable products. Among the wild animals are the maneless lion of Gujerat, the wild ass, leopard, tiger, black bear, bison, antelopes and venomous snakes. The climate varies greatly from one district to another, two extremes being represented by upper Sind, with great heat and little rain, and the Konkan, with excessive rainfall, especially from June to October.

About three-fourths of the population are engaged in agriculture. The chief products are cotton, rice, millet, wheat, barley, dates, the cocoa-palm, oil-seeds, sugar and indigo. In 1912–13 the net area actually cropped was 25,180,263 acres. The growth of cotton in Bombay received a great impetus during the American Civil War; and although the great demand did not prove lasting, cotton continues to be a highly important crop, part of the produce being exported, and a considerable portion of it worked up in the cotton-mills of Bombay city, Armedabad and Kandesh. Hand looms are also largely employed. Other important industries are silk-weaving, wood carving and metal working. The foreign trade of Bombay is very great; its imports, chiefly cotton piece-goods, sugar, oils, metal and machinery, silks and other manufactures, exceed those of any other province in British India, while its exports, consisting of raw cotton, seeds, wheat, opium, etc., are second only to those of Bengal. In 1905 there were 7,980 miles of railway, exclusive of Sind; the chief lines are the Bombay, Baroda and Central India, northwards; the Great Indian Peninsular and Indian Midland, eastward; the Madras and Southern Mahratta, southeastward, of all of which Bombay city is the terminus; and the Northwestern Railway, the terminus of which is the port of Karachi. In 1912–13 the presidency expended $5,115,900 on education; there were 14,100 public educational institutions with 906,827 students and 3,020 private educational institutions with 80,858 students. The University of Bombay, one of the five in British India, was established in 1857. According to the census of 1911 the population in British territory numbered 19,672,643, of whom only 1,372,826 were literates. The population of the native states was 7,411,675, of whom 487,667 were literates.

The government of the presidency is administered by a governor in council consisting of the governor as president, and two other members of the Indian Civil Service, all appointed by the Crown. There is also a legislative council of 48 members, 21 of whom are nominated, 21 elected, 4 ex-officio and 2 extra members. The native states are under the superintendence of British agents placed at the principal courts.

Bibliography.— Campbell, J., ‘Gazeteer of the Bombay Presidency’ (26 vols., Bombay 1896); Douglas, J., ‘Bombay and Western India’ (London 1893); Edwards, S. M., ‘The Rise of Bombay’ (London 1902); Lee-Warner, Sir W., ‘The Presidency of Bombay’ (London 1904); Malabari, B. M., ‘Bombay in the Making’ (London 1910).

BOMBAY, India, city and the chief seaport of western India, capital of the presidency of the same name, situated at the southern extremity of the island of Bombay, and connected with the mainland by causeways and breakwaters, and with the interior by extensions of the Bombay, Baroda and Central India and the Great Indian and Peninsula railway, the terminus of the latter being a splendid edifice which cost $1,500,000. Extensive water works have been constructed on the mainland at Lake Tanza, 65 miles north, including a dam two miles in length, and were opened in 1892. The town comprises two main portions, one known as the Fort, and formerly surrounded with fortifications, on a narrow point of land with the harbor on the east side and Back Bay on the west; the other known as the City, a little to the northwest. The European population live mostly in villas surrounded with extensive areas, called compounds, in various parts of the island, the favorite location being the suburb of Malabar Hill. The native quarters, with their handsome bazars, temples, carved and elaborately ornamented houses, and polyglot Asiatic population, are exceedingly picturesque. Bombay has many handsome buildings, both public and private, and a number of fine streets, the latter being in many cases traversed by street railways. The castle, the government offices and almost all the merchants' warehouses and offices are in the fort. On the esplanade facing southwest is a fine range of public buildings, including the secretariat, the courts of justice, the offices of the public works department, the post and telegraph offices, etc. There are a cathedral and several other churches in Bombay, which is the see of the Anglican bishop. There are six hotels, including the Taj Mahal Hotel, opened in 1904, one of the finest in India. In 1857 a university was opened, and the university hall, library and clock tower are among the handsomest buildings in the city. Other educational institutions are the governmental Elphinstone College, the Grant Medical College, two missionary colleges, Sassoon's Institute, schools of art and law and the Victoria Jubilee Technical Institute. There are several fine hospitals and three English newspapers besides native ones. Various industries, such as dyeing, tanning, metal, lacquer, gold and silver thread working, pottery and wood carving, are actively carried on, and there are now 83 cotton mills employing 180,000 hands. The commerce of the port was greatly benefited by the opening of the Suez Canal and is now very extensive, by far the greater portion of the exports and imports of the presidency passing through Bombay. The chief article of export is raw cotton, the chief import cotton piece-goods, the commerce being chiefly with Great Britain. The harbor is one of the largest and safest in India; while its scenery and that of the neighboring continent presents a rare combination of grandeur and beauty. It is situated between the islands of Colabah, Bombay and Salsette on the one hand, and the mainland and islands of Caranjah and Elephanta on the other. It is 14 miles long by five miles wide and is defended by numerous batteries armed with the most modern guns. There are large and commodious docks, chief of which are the Prince's dock, the Victoria dock, with a water area of 25 acres, and the new Alexandra dock, the largest in India, 50 acres in area, the foundation stone of which was laid in 1905, erected at a total cost of over $25,000,000 (including reclamation of land and new railway station). There is a large traffic with steam vessels between Bombay and Great Britain, and regular steam communication with China, Australia, Singapore, Mauritius, etc. A railway between Bombay and Tannah, on the island of Salsette, 20 miles distant, opened in 1853, was the first Indian railway constructed. The island of Bombay is about 11 miles long from north to south, and about three miles broad, formed by two ranges of rock running parallel to each other on opposite sides of the island. The interior was formerly liable to be overflowed by the sea, to prevent which substantial walls and embankments were constructed.

Bombay was obtained by the Portuguese in 1534 from the Sultan Bahadur; by them it was ceded to Great Britain in 1661, as part of the dowry of the Infanta Catherine, bride of Charles II, and in 1668 it was transferred to the East India Company. The following year the modern city was founded by Gerald Aungier, president of Surat from 1669–77, who fortified it, set up law courts and established freedom of trade and religion. During the American Civil War, Bombay became one of the greatest cotton markets of the world and enjoyed immense prosperity, followed by a financial crisis at the end of the war, from which however it quickly recuperated. Next to Madras it is the oldest of the British possessions in the East, and in trade and population it is only excelled by Calcutta, which owes its pre-eminence largely to the fact that Bombay has since 1891 been frequently decimated by the plague. The government of the city consists of a municipal corporation of 72 members (of whom 16 are nominated by the government, 36 by the rate payers, 16 by the justices of the peace, 2 by the senate of the university and 2 by the chamber of commerce), and a town council of 12 members (four of whom are nominated by the government and the rest by the corporation). By the census of 1911 the population numbered 979,445, of whom 664,042 were Hindus, the remainder being composed of Mohammedans, Parsees, Jains, Europeans and Eurasians (16,082), native Christians and Jews. Consult Drewitt, F., 'Bombay in the Days of George IV' (London 1907); Karkaria, R. P., 'The Charm of Bombay' (Bombay 1915); 'The Gazeteer of Bombay City and Island,' compiled by D. M. Edwards (Bombay 1909–10).

BOMBAY DUCK. See Bummaloti.

BOMBAZINE, bum-bȧ-zēn', derived from *bombyx,* the Greek term for silk and silkworm, is a mixed tissue of silk and worsted, and was long woven both plain and colored. The latter, however, has gone into disuse, and the only color now used is black, for which there is an extensive demand in Spain and South America, where some of the religious orders use it, and it generally forms the material of the almost universally worn Spanish *mantilla.* The manufacture was originally introduced into England by a colony of Dutch or Flemings, who settled in Norfolk, and long continued to have its principal seat at Norwich, the capital of that county, though it is now chiefly confined to Halifax and Kidderminster.

BOMBERG, Daniel, a famous Christian printer of Hebrew books. He lived and worked in Venice between 1516 and 1549, during which time he changed the whole mode of procedure in Hebrew typography. Among his noteworthy undertakings was the publication of the *editio princeps* (1516–17) of the Rabbinical Bible, containing Hebrew text with rabbinical commentaries, etc. Another of his notable works was the first complete edition of the Talmud (1520–23).

BOMBERGER, John Henry Augustus, American ecclesiastical writer: b. Lancaster, Pa., 13 Jan. 1817; d. Collegeville, Pa., 19 Aug. 1890. Educated at Marshall College and Mercersburg Theological Seminary, he was ordained a minister of the German Reformed Church in 1838. After having occupied several pulpits he was called to Philadelphia by the First Reformed Church (1854–70). He became president of Ursinus College at Collegeville, Pa., in 1870. He exercised considerable influence upon German Protestant thought in America. Among his most notable works are the translation into English of six volumes of Herzog's ‹Protestant Theological and Ecclesiastical Encyclopedia› (condensed into 2 vols., 1856–58), and the original books ‹Five Years at Race Street Church› (1859); ‹The Revised Liturgy› (1866); ‹Reformed not Ritualistic› (1867).

BOMBON, Philippines, a large, fresh water lake in the island of Luzon, about 50 miles south of Manila. It is 105 square miles in area. There is a small island in the centre, from which rises the volcano Taal, whose height is only 850 feet. The waters of the lake find an outlet to the sea through the Pansipit River.

BOMBPROOF, a structure intended to resist or repel artillery shot and shell, generally underground or excavated in a hillside. When designed for permanency they are either of masonry or caves cut into solid rock. In the light of recent developments under the action of high explosives bombproofs are excavations 30 to 40 feet below the surface reached by a shaft on an incline with several openings. The interiors are lined with concrete and in some cases roofed with railroad iron. Galleries radiate in many directions, and the constructions are large enough to house a large force of men. See also BLINDAGE.

BOMBS. See PYROCLASTIC.

BOMBYCIDÆ, bŏm-bĭs'ĭ-dē, a group of genera comprising some of the largest and most regal of moths. Their thick, heavy bodies and small sunken heads, the mouth parts often obsolete, the tongue either wholly or partly atrophied; the broadly pectinated antennæ; the broad, often falcate, wings; and their sluggish habits, afford good characters for distinguishing them. The larvæ are silk-worms, or «spinners.» They are often thick, usually more hairy or spiny than those of other groups of moths, or as in the Chinese silk-worm, smooth; while in the large *Attacus ablas, Telea polyphemus, Samia cecropia* and *Tropæa luna*, the worms are short, fat, fleshy and sluggish. They spin a more or less dense cocoon of silk to protect the enclosed pupa from sudden changes in the weather. Although the name *Bombycidæ* is confined to the small group represented by the silk-worm (*Bombyx mori*), all the typical spinners are referred to as bombycine moths. The most typical families are the *Notodontidæ Sphingicampidæ, Saturniidæ* and *Remileucidæ*. Of these the *Sphingicampidæ,* however, like the *Sphingidæ,* to which they may have given origin, spin no cocoon and transform in the earth, the pupa being subterranean. (See also SILK-WORM). Consult Packard, ‹Monograph of the Bombycine Moths of America›; ‹Memoirs of the National Academy of Sciences› (Vol. VII, Washington 1896); Beutenmüller, ‹Descriptive Catalogue of the Bombycine Moths within Fifty Miles of New York City› (‹Bulletin› American Museum of Natural History).

BOMFORD, bum-fẽrd, **George,** American soldier: b. New York 1780; d. Boston, Mass., 25 March 1848. He was graduated at West Point in 1805 and was assigned to the engineer corps. Between 1805 and 1812 he worked on the fortifications of New York harbor, the defenses of Chesapeake Bay, and was superintending engineer of the works on Governor's Island. During the War of 1812 he was brevetted lieutenant-colonel for distinguished service in the ordnance department. He introduced bomb cannons, made on a pattern of his own invention, which were called Columbiads, a kind of heavy gun combining the qualities of gun, howitzer and mortar. On 30 May 1832 he was appointed chief of ordnance, and on 1 Feb. 1842 became inspector of arsenals, ordnance, arms and munitions of war, in which duty he continued until his death. Consult Cullum, ‹Officers and Graduates of the United States Military Academy› (Vol. I, 1868).

BOMPAS, William Carpenter, Canadian clergyman: b. in London, England, 20 Jan. 1834; d. 1906. In 1865 he offered himself for work in the northwest; was ordained Anglican bishop of Athabasca, 3 May 1874; and (on the division of his diocese) was bishop of Mackenzie, 1884–91, and of Selkirk, 1891–1905.

BON MARCHÉ', bôṅ mär-shā', one of the large department stores of Paris, situated on the Rue de Bac and Rue de Sèvres. It was founded in 1853 by Aristide Boucicault as a small store in the Rue de Bac and grew little by little to be the great establishment it now is. The present building was begun in 1869, was first used in 1872, and has been enlarged at various times since then. The management is co-operative, pensions are awarded to the employees and there is a regular system of promotion. It is thought that this organization has contributed largely to the success of the store.

BONA, Giovanni, Italian cardinal: b. Mondovi, Piedmont, 10 Oct. 1609; d. Rome, 27 Oct. 1674. He was renowned for his piety and learning, a collaborator in the ‹Acta Sanctorum,› the author of ‹Rerum Liturgicarum Compendium,› which is an authority on the service of mass, and of ‹De principiis vitæ Christianæ,›— a book which has frequently been compared to the ‹Imitation of Christ,› and of which a French translation has appeared (1855). His ‹Manducatio ad Cœlum› was translated into English (London 1672; 7th ed., 1712). A translation was made by L'Estrange, ‹A Guide to Eternity› (London 1900). His complete works in Latin were published in Antwerp (2 vols., 1677). Consult the life by A. Ighina (Mondovi, Italy, 1874).

BONA, Algeria, fortified seaport city of Constantine department on a bay of the Mediterranean at the base of a hill near the mouth of the Sebus, 135 miles by rail northeast of Constantine. The town, divided into upper and lower Bona, dominated on the summit by Fort Cicogne, was greatly improved and modernized after the French occupation in 1832. The principal buildings are the quasi-Byzantine cathedral of Saint Augustine, containing the right arm relic of the Saint brought from Pavia in 1842, and the Great Mosque on the Place d'Armes built from the ruins of ancient Hippo. The town has good bazars, banks, hotels, theatre, manufactures of native clothing, tapestry, saddlery, a thriving trade in grain, wool, hides, phosphate, wax and coral and regular steamboat service with Algiers, Tunis and Marseilles. Occupying the site of ancient Aphrodisium connected by canal with the once famous city of Hippo Regius, the favorite residence of the Numidian kings, and the bishop's see of Saint Augustine, who died there 430, nearby are interesting remains of this early centre of Christian civilization and commerce in northern Africa, celebrated for its schools, theatres, aqueducts, palaces and temples which were converted into churches and monasteries. It was destroyed by Mohammedans under Caliph Osman, 646. Pop. 35,000.

BONA DEA, the good goddess, a mysterious divinity of the Roman mythology, the wife or the daughter of Faunus. Her worship was secret, performed only by women; men were even required to ignore her name. Her sanctuary was in a cavern in the Aventine Hill, but her festival, which occurred 1 May, was celebrated in a separate room in the dwelling of the consul who then had the fasces. No man was allowed to be present, and all male statues in the house were covered. The wine used at this festival was called milk, and the vessel in which it was kept, *mellarium*. After the sacrifices, bacchanalian dances were performed. According to Juvenal, licentious abominations marked these festivals. The snake was the symbol of the goddess, and this would point to her being considered as possessing a curative, medical power, and in her sanctuary various herbs were offered for sale. By the Greeks the Bona Dea was identified with Hecate, Semele and other divinities.

BONA-FIDE («in good faith»), a technical legal expression, to which the law of Great Britain and this country has annexed a certain idea. It is a term used in statutes in England and in acts of the legislatures of all the United States, and signifies a thing done really, with a good faith, without fraud or deceit, or collusion or trust. The word «bona-fide» is restrictive, for a debt may be for a valuable consideration and yet not bona-fide. A debt must be bona-fide at the time of its commencement or it can never become so afterward. If a contract be made with good faith, subsequent fraudulent acts will not vitiate it, although such acts may raise a presumption of antecedent fraud and thus become a means of proving the want of good faith in making the contract.

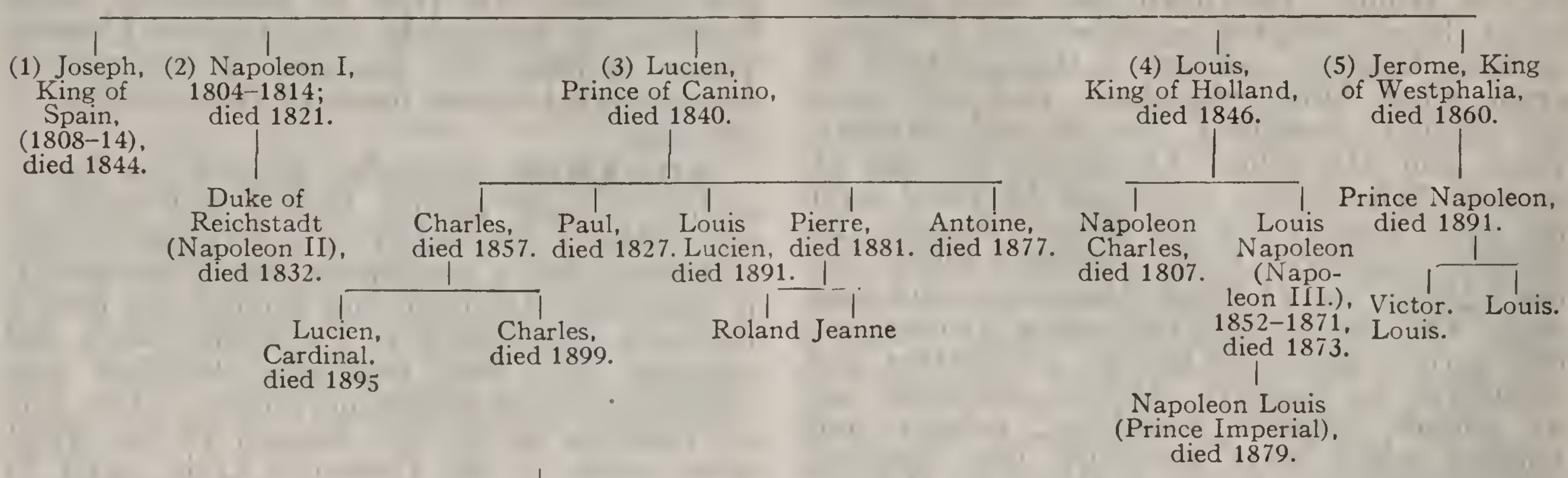
BONALD, bō-näl, **Louis Gabriel Ambroise,** (VICOMTE DE, vē-cŏṅt dė), French philosopher: b. 1754; d. 1840. During the Revolution he joined the Royalist army under the Bourbon princes. He returned to France under Napoleon; became coeditor of the *Mercure* with Chateaubriand and Fiévée, and in 1808 was appointed Minister of Public Instruction. After the Restoration,— as the deputy for his department,— he voted with the Ultramontane or Theocratic party in the Chambre Introuvable, and in his political career, as in his philosophical works, was the ardent advocate of absolutism, of the infallibility of the Pope and of the Jesuits. In 1830 he refused to take the oath of allegiance to the new dynasty.

BONANNO, bō-nän′nō, Italian architect and sculptor. In 1174 he commenced, with Wilhelm of Innsbrück, the famous Leaning Tower of Pisa. He was also the designer of the celebrated bronze doors of the cathedral of that city.

BONANZA, bō-năn′za, Spanish for «prosperity,» a term applied to any rich mass of ore suddenly discovered by a fortunate stroke and furnishing a continuous run of prosperity. It came into American and English use during the early exploitation of California mines and diggings and now popularly describes any fortunate wealth-producing source. The title of Bonanza mines was applied to the great silver yields of the Comstock Lode (q.v.) in Nevada in 1876.

BONAPARTE, or **BUONAPARTE,** the name of a Corsican family now famous in history. It was spelt Buonaparte by the Emperor Napoleon's father and the Emperor himself till 1796, though the more usual, modern form also occurs in old Italian documents. Several families are mentioned as early as the 12th century who bore the name of Bonaparte, and took a position of some prominence in Italy. In 1122, for instance, a Bonaparte was banished from Florence as a Ghibelline. Corrado Bonaparte is mentioned in 1170 and Jacopo Bonaparte in 1210 as knights of the Order of the Golden Spur. The office of *podestà* was held by Nordio Bonaparte in Parma in 1272, by Pietro Bonaparte in Padua 1285, and by Giovanni Bonaparte in Florence 1333. In 1250 a Bonaparte was syndic of Ascoli, and in 1440 Cesare Bonaparte was chosen as head of naval affairs at Sarzana. A Giovanni Bonaparte is said to have married a niece of Pope Nicholas V in 1404, but this seems doubtful for chronological reasons. It is however certain that about 1454 Niccolo Bonaparte was ambassador of this Pope to several courts, and vicar of the Holy See in Ascoli. Another Niccolo Bonaparte, professor at San Miniato in the 16th century, is stated to have been the author of the comedy ‹La Vedova› (Florence 1568); and a work on the Sack of Rome in 1527 is attributed to the Tuscan Giacomo or Jacopo Bonaparte, who was an eyewitness of the event. The connection between these different Bonapartes is by no means well established; yet in 1771 the relationship of the Corsican Bonapartes with the Florentine Bonapartes was judicially recognized. In Corsica itself a Messire Bonaparte appears as witness to an act executed by Berengar II of Italy as early as 947, and it is therefore not improbable that the family originally emigrated from this island to the mainland, and that a branch of the Genoese line returned to their old home in the 16th century. From the time of Gabriel Bonaparte, who settled at Ajaccio in 1567 and took part in the naval expeditions against the Moors, the Bonapartes ranked as a patrician family of that town. In 1576 Girolamo Bonaparte was elected deputy of Ajaccio in the senate of Genoa, and in 1614 Francesco was chosen captain of his native town. In 1757 Joseph, the grandfather of Napoleon I, received a formal patent of nobility from the Grand Duke of Tuscany. About the middle of

THE BONAPARTE FAMILY (*Male Issue*).


CHARLES BONAPARTE.
(1) Joseph, King of Spain, (1808–14), died 1844.
(2) Napoleon I, 1804–1814; died 1821.
Duke of Reichstadt (Napoleon II), died 1832.
(3) Lucien, Prince of Canino, died 1840.
Charles, died 1857.
Lucien, Cardinal, died 1895
Charles, died 1899.
Paul, died 1827.
Louis Lucien, died 1891.
Pierre, died 1881.
Roland
Jeanne
Antoine, died 1877.
(4) Louis, King of Holland, died 1846.
Napoleon Charles, died 1807.
Louis Napoleon (Napoleon III.), 1852–1871, died 1873.
Napoleon Louis (Prince Imperial), died 1879.
(5) Jerome, King of Westphalia, died 1860.
Prince Napoleon, died 1891.
Victor. Louis.
Louis.

the 18th century there remained three male representatives of the family of Bonaparte at Ajaccio, the archdeacon Lucien Bonaparte, his brother Napoleon, and their nephew Charles, who became father of the Emperor Napoleon I and of a numerous family of princes.

BONAPARTE, Charles, father of the Emperor Napoleon I: b. Ajaccio, Corsica, 29 March 1746; d. Montpellier, 24 Feb. 1785. He was carefully educated, studied law at Pisa, and soon after his return married without the consent of his relatives Letitia Ramolino, a beautiful patrician. He fought under Paoli for the independence of Corsica, but resistance to the French proving useless he went over to their side. In 1771, when Louis XV caused 400 Corsican families to be selected who alone were to be considered noble, the Bonaparte family,— and consequently Charles,— was among the number. By the influence of the French governor, Marbœuf, who was very friendly toward the family, he was (1773) named royal councillor and assessor for the town and province of Ajaccio. As a member of the deputation of Corsican nobles sent to the court of France in 1777 he resided several years at Paris and was fortunate enough to secure a free admission for his eldest son, Joseph, to the seminary at Autun, another for his second son, Napoleon, to the military school of Brienne, and a third for his daughter, Maria Anna, to the educational institution at Saint Cyr. He returned to Corsica in 1779, and afterward went to Montpellier for the benefit of his health, but did not recover. By his marriage with Letitia Ramolino he left eight children; Joseph (see BONAPARTE, JOSEPH), King of Spain; Napoleon I, Emperor of the French (see NAPOLEON I); Lucien (see BONAPARTE, LUCIEN), Prince of Canino; Maria Anna, afterward called Elise, Princess of Lucca and Piombino, and wife of Prince Bacciocchi (see BACCIOCCHI, FELICE PASQUALE); Louis (see BONAPARTE, LOUIS), King of Holland; Carlotta, afterward named Marie Pauline, Princess Borghese (q.v.); Annunciata, afterward called Caroline, wife of Murat (see MURAT), King of Naples; and Jerome (see BONAPARTE, JEROME), King of Westphalia. See also BONAPARTE, LETITIA RAMOLINO; NAPOLEON III.

BONAPARTE, Jerome, youngest brother of Napoleon: b. Ajaccio, Corsica, 15 Nov. 1784; d. near Paris, 24 June 1860. At an early age he entered the French navy as a midshipman. In 1801 he was sent out on an expedition to the West Indies, but the vessel being chased by English cruisers, was obliged to put in to New York. During his sojourn in America, Jerome Bonaparte became acquainted with Miss Elizabeth Patterson, the daughter of the president of the Bank of Baltimore and a descendant, as is asserted, of "Old Mortality," immortalized by Sir Walter Scott. His addresses to this young lady having been accepted, they were married 24 Dec. 1803, according to the Roman Catholic ritual, in the cathedral of Baltimore, and in 1805 embarked for Europe. This marriage did not meet with the approval of the Emperor Napoleon, whose ambitious views it thwarted, and he accordingly, after an ineffectual application to Pope Pius VII to have it dissolved, issued a decree declaring it to be null and void. On 12 Aug. 1807, Jerome married Catherine Sophia, Princess of Würtemberg, and a few months afterward was created King of Westphalia and crowned with great pomp at Cassel, 1 Jan. 1808. His government was not marked by either judgment or prudence; little regard was paid to national feelings; and the finances of the state, both from mismanagement and the frequency of hostile incursions, became hopelessly embarrassed. The battle of Leipzig put an end to Jerome's reign and he was obliged to take flight to Paris. On the conclusion of the Treaty of Paris he left France and proceeded first to Switzerland, thence to Grätz and in the beginning of 1815 to Trieste. On his brother's return from Elba he again proceeded to Paris and was nominated a peer of France. At the battles of Ligny and Waterloo he was actively engaged, displayed considerable bravery and received a wound in the arm. On Napoleon's overthrow he retired first to Switzerland, then to Würtemberg and from this period up to the fall of Louis Philippe, in 1848, resided in different parts of Europe under the title of the Comte de Montfort; latterly chiefly in Florence. On the outbreak of the revolution of February 1848 he returned to Paris and was appointed (23 December) governor-general of the hospital of the Invalids and in 1850 a marshal of France. In 1852 he was made president of the Senate. Reference has already been made to the two marriages contracted by Jerome Bonaparte. From his union with Miss Patterson only one son proceeded, Jerome (see BONAPARTES OF BALTIMORE). By his second wife Jerome Bonaparte had three children. The elder son, JEROME BONAPARTE, b. 1814; d. 1847; MATHILDE BONAPARTE, Princess of Montfort (b. Trieste, 27 May 1820; d. Paris, 2 Jan. 1904), married the Russian Count Anatol Demidoff, and lived at the court of Louis Napoleon during his presidency; the younger son, NAPOLEON JOSEPH CHARLES PAUL BONAPARTE, commonly known as PRINCE NAPOLEON (b. Trieste, 9 Sept. 1822; d. 17 March 1891), passed his youth in Italy; entered the military service of Würtemberg in 1837; afterward traveled in several countries of Europe; and was banished from France (1845) on account of his intercourse with the Republican party. After February 1848 he was elected to the National Assembly. He commanded an infantry division at the battles of Alma and Inkermann. In 1859 he married the Princess Clotilde, daughter of Victor Emmanuel, by whom he had two sons (see BONAPARTE PRETENDERS) and a daughter. After the fall of the empire he took up his residence in England, but returned to France in 1872. On the death of the Prince Imperial, son of the Emperor Louis Napoleon, in Zululand in 1879, the eldest son of Prince Napoleon became the heir of the Bonapartist hopes. When, in 1886, the chiefs of the Bourbon family were, by a vote of both chambers, expelled from France, Prince Napoleon and his eldest son were exiled also as pretenders to the throne.

BONAPARTE, Joseph, eldest brother of Napoleon I: b. Corte, Corsica, 7 Jan. 1768; d. Florence, Italy, 28 July 1844. He was educated in France at the college of Autun, returned to Corsica in 1785 on his father's death, studied law, and in 1792 became a member of the new administration of Corsica under Paoli. In 1793, after Paoli had called in English aid, he emigrated to Marseilles, and became brother-in-law to Bernadotte, afterward King of Sweden, by marrying one of the daughters of a wealthy banker named Clari. In 1796 he accompanied the army of Italy as commissary, in 1797 was elected a Corsican deputy to the Council of Fve Hundred, and shortly after was sent by the Directory, as ambassador to the Pope. He returned abruptly, and had not long resumed his seat in the Council of Five Hundred, when his brother having become 1st Consul he was made councillor of state, and employed to negotiate a treaty with the United States. Shortly after, in 1801, he negotiated the peace of Luneville with the Emperor of Germany, and in 1802 that of Amiens with Great Britain. Napoleon having now begun to parcel out kingdoms among his family, Joseph was made King of Naples and Sicily in 1806, but had reigned only two years when his brother recalled him and sent him to Madrid to be King of Spain and the Indies. His seat at Naples had not been comfortable, and he now found himself on a bed of thorns. His kingship lasted nominally for five years, but he was chased once and again from his capital, and the third time, in 1813, fled not to return. In these appointments Joseph was merely a tool in his brother's hands. In 1814, after the fatal expedition to Russia, Napoleon on setting out for the army made him lieutenant-general of the empire and head of the council of regency. After the battle of Waterloo he sailed for the United States and lived for some years at Bordentown, N. J., where he employed himself in agriculture, and was highly esteemed by his neighbors. During his exile he assumed the title of Count de Survilliers. In 1832 he went to England and after residing there for some time repaired to Italy, and spent his closing days in Florence. His wife appears to have been prevented by ill health from accompanying him to the United States. She survived her husband but a few months. There were two daughters. The elder became the wife of the eldest son of Lucien Bonaparte, and the younger was married to the second son of Louis Bonaparte.

BONAPARTE, Lætitia Marie Wyse, MADAME DE SOLMS-RATTAZZI-DE RUTE, French author: b. Waterford, Ireland, 1829; d. Paris, 1902. Her mother, Letitia, who claimed to be the daughter of Lucien Bonaparte by his second wife, married Thomas Wyse, an Irishman. Lætitia, who married Frederic de Solms in 1850, four years later separated from him, assumed the title of Princesse de Solms, settled in Savoy, then independent, and established there the famous literary circle *Les matinées d'Aix* in 1853. Victor Hugo, Kossuth, Eugene Sue, Lamartine, Dumas, Rochefort and Sainte Beuve were numbered in her acquaintance. Under the pseudonym of 'Baron Stock' she was a contributor to the *Constitutionnel.* When Savoy was annexed to France she established a salon in Paris, which became a popular literary and social shrine. After De Solm's death, she married the Italian statesman U. Rattazzi; when he died she married Señor de Rute, a Spaniard whom she outlived. Besides a great amount of miscellaneous writings, she wrote the novels 'Les Mariages de la créole' (1866); 'Si j'étais reine — If I were queen' (1866), largely autobiographical; the first book was reprinted as 'La chanteuse' (1870).

BONAPARTE, Letitia Ramolino, mother of Napoleon, and hence known by the name of MADAME MÈRE: b. Ajaccio, Corsica, 24 Aug. 1750; d. Rome, 2 Feb. 1836. She was married in 1764 to Charles Bonaparte (see BONAPARTE, CHARLES). Left a widow in 1785, she continued to reside in Corsica till 1793, when she removed to Marseilles. In this city she lived in straitened circumstances. After her son became 1st Consul, she fixed her residence at Paris, had a separate establishment assigned to her, but had little taste for ostentation. All things considered, she conducted herself with great discretion, performing her part becomingly in the station to which she had been so unexpectedly elevated, and never allowing herself to forget that the sudden rise of her family might one day be terminated by an equally sudden fall. She joined the Emperor in his exile in Elba in 1814, and after Waterloo she retired to Rome and resided in the household of her step-brother, Cardinal Fesch. There she collected most of the surviving members of her family around her and lived to the advanced age of 86.

BONAPARTE, Louis (COUNT OF SAINT LEU), second younger brother of the Emperor Napoleon I and father of Napoleon III: b. Ajaccio, Corsica, 2 Sept. 1778; d. Leghorn, Italy, 25 July 1846. He was educated in the artillery school at Châlons, accompanied Napoleon to Italy, and afterward to Egypt. He subsequently rose to the rank of a brigadier-general, and in 1802 married Hortense Eugénie Beauharnais, Napoleon's step-daughter (see BEAUHARNAIS, HORTENSE EUGENIE), from whom he separated in 1810. In 1806, on Schimmelpenninck, grand pensionary of Holland, demitting his office, Louis Bonaparte was compelled by his brother, notwithstanding his protestations, to accept the Dutch crown. The difficult situation in which he was placed rendered it impossible for him to be anything else than a mere viceroy of Napoleon; but to his credit it must be recorded that he exerted himself to the utmost in promoting the welfare of his new subjects. With all his efforts, however, he found himself unable to restore the finances of the country to a healthy condition: a quarrel took place between him and his brother relative to the continental system maintained by the latter, which had proved most injurious to Dutch commerce, and on 1 June 1810 he abdicated the sovereignty and retired to Grätz under the title of the Count of Saint Leu. Holland was thereupon annexed to France. In 1814 Louis paid a visit to Paris and strongly counseled his brother to make peace with the allies. After the Restoration he took up his abode at Rome; in 1826 he removed to Florence, and from thence, a short time after his son's escape from the fortress of Ham, to Leghorn.

BONAPARTE, Lucien (PRINCE OF CANINO), next younger brother of Napoleon I: b. Ajaccio, Corsica, 21 March 1775; d. Viterbo, Italy, 29 June 1840. He emigrated to Marseilles in 1793, and made himself conspicuous as a hot-headed Republican by addressing revolutionary clubs and publishing bombastic pamphlets. Shortly after, having been appointed to a situation in the commissariat at the small town of Saint Maximin in Provence, he married the innkeeper's daughter. He made a narrow escape during the Reign of Terror, and in 1796 was appointed commisary at war, and on his election as a member of the Council of Five Hundred, took up his residence in Paris. He is said to have written to his brother in Egypt complaining of the incapacity of the executive Directory, and urging his return; and in 1799, when the council wished to outlaw Napoleon, Lucien, who was president, after manfully resisting the motion, slipped quietly out of the chair in the confusion and sent in soldiers who cleared the hall. The revolution thus mainly accomplished by his decisive procedure led to the establishment of the consular government, and Lucien was a member of the commission which framed its constitution. Afterward appointed Minister of the Interior, he was active in the encouragement of education, art and science and organized the prefectures. As Ambassador to Madrid (1800) he contrived to gain the confidence of King Charles IV and his favorite, Godoy, and to undermine the British influence, which had until then been paramount at the court of Spain. On his return to Paris in 1802 he was a member of the tribunate, and then a senator, and having lost his first wife, married a stockbroker's widow. This marriage, and other concurring causes, appear to have given deep offense to Napoleon, and in the enactment fixing the succession to the crown, while Joseph and Louis were named eventual heirs, Lucien and Jerome were not mentioned. The crowns of Italy and Spain were offered Lucien on condition of his divorcing his wife, but he refused them and chose a retired life, devoting himself to art and science. He fixed his residence at Rome, where he appears to have gained the good graces of Pius VII, who created him, in 1814, Prince of Canino. During Napoleon's haughty treatment of the Pope, Lucien freely expressed his displeasure, and apparently despairing of a reconciliation with his brother, or perhaps not caring to ask for it, he embarked for the United States in 1810, but had not proceeded far when he was captured by a British cruiser and carried to Malta. Ultimately he was brought to England and allowed to reside on parole near Ludlow Castle. Here he employed much of his time in writing a poem entitled ‹Charlemagne ou l'Église Sauvée.› After the battle of Waterloo his brother appointed him his extraordinary commissioner to the chamber of deputies. He showed no lack of zeal in endeavoring to arouse a feeling of sympathy, but found the attempt vain and had to leave matters to take their course. He afterward returned to Italy. Besides the poem ‹Charlemagne,› which has been translated into English, he wrote another, called ‹La Cyrnéide ou la Corse Sauvée,› and an autobiography, published during his lifetime.

By his first wife, Lucien had two daughters; by his second nine children. His eldest son, CHARLES LUCIEN JULES LAURENT BONAPARTE, Prince of Canino and Musignano: b. Paris, 24 May 1803; d. 30 July 1857, achieved a considerable reputation as a naturalist, chiefly in ornithology. He published a continuation of Wilson's ‹Ornithology of America› (1825–33); the ‹Iconografia della Fauna Italica› (1832–41); his *chef d'œuvre,* etc. During the later years of his life he took a prominent part in Italian affairs as a supporter of the Liberal party. One of his sons was Cardinal Lucien Bonaparte (1828–95). PAUL MARIE BONAPARTE, the second son, b. 1808, took part in the Greek war of liberation and died by the accidental discharge of a pistol in 1827. The third son, LOUIS LUCIEN BONAPARTE (b. Thorngrove, England, 1813; d. 1891), early devoted himself with equal ardor to chemistry, mineralogy and the study of languages, and became an authority of the first rank in Basque, Celtic and comparative philology generally. His election for Corsica in 1848 was annulled, but he was sent to the Constituent Assembly for the Seine department next year, and was made senator in 1852. The total number of separate books written either by himself or at his instigation and encouragement amounted to no less than 222. Among these are a translation of Saint Matthew's version of the parable of the sower into 72 languages and dialects of Europe (1857); a linguistic map of the seven Basque provinces, showing the delimitation of the «Euscara,» and its division into dialects, sub-dialects and varieties (1863); a Basque version of the Bible in the Labourdin dialect (1865); a treatise on the Basque verb (1869), etc. A great work produced under his patronage from 1858 to 1860 was a version of the Song of Solomon in 22 different English dialects, besides four in Lowland Scotch and one in Saxon. He lived long in England, where a Civil List pension of $1,250 was granted to him in 1883. The fourth son, PIERRE NAPOLEON BONAPARTE (1815–78), passed through many changes of fortune in America, Italy and Belgium and returned to France in 1848. In 1870 he shot a journalist, Victor Noir, a deed which created great excitement in Paris; and being tried, was acquitted of the charge of murder, but condemned to pay $5,000 to Victor Noir's relatives. The youngest son, ANTOINE BONAPARTE (1816–77), fled to the United States after an affair with the papal troops in 1836, and returned to France in 1848, where he was elected to the National Assembly in 1849.

BONAPARTE, Napoleon. See NAPOLEON I.

BONAPARTE PRETENDERS. Of the Emperor Napoleon I and his brothers, Joseph and Louis, male issue is now extinct. The Emperor's brothers, Lucien and Jerome, are represented by the following living descendants, and they constitute the present imperialist house of France:

PRINCE VICTOR NAPOLEON (of the house of Jerome): b. 18 July 1862, is the son of the late Prince Napoleon and the Princess Clotilde, sister of King Humbert of Italy. The Prince has been recognized by his party as the undisputed head of the Bonaparte family. He married in 1910 Princess Clementine of Belgium, has one son, Louis, born in 1914, and resides in Brussels. His only brother, Prince Louis Napoleon, born in 1864, is an officer in the Russian army. His sister, born in 1866, is the widow of Prince Amadeus of Italy, by whom she had a son, Prince Humbert, born in 1889.

PRINCE CHARLES NAPOLEON, brother of the late Cardinal Bonaparte, who died 12 Feb. 1899, was the last representative of the eldest son of Napoleon's brother, Lucien, in the male line. He was born in 1839; was married and had two daughters — Marie, wife of Lieutenant Giotti, of the Italian army, and Eugénie, unmarried. He had four sisters, three of whom were married, respectively, to the Marquis of Roccagivoine, Count Primoli and Prince Gabrelli.

PRINCE ROLAND BONAPARTE is the only living male cousin of Prince Charles Napoleon. He is a son of the late Prince Pierre Napoleon Bonaparte (1815–81); was born in 1858; married in 1880 the daughter of Blanc, the proprietor of the Monte Carlo gambling establishment. He has been twice president of the French Geographical Society, is keenly interested in scientific research and travel, and has written books on those subjects. His wife died in 1882, leaving him a daughter, Marie, and a fortune. His daughter was married in 1907 to Prince George, second son of King George I of Greece. He has one sister, Jeanne, born in 1861, and married to the Marquis de Villeneuve.

BONAPARTES OF BALTIMORE, the branch of the family residing in Baltimore, Md., and derived from the marriage of Jerome Bonaparte, brother of the Emperor Napoleon I, with Elizabeth Patterson, daughter of William Patterson, an eminent merchant in the city of Baltimore. Elizabeth was born 6 Feb. 1785, and was scarce 18 years of age when Jerome Bonaparte in command of a French frigate landed in New York in 1803. She, at that time, was distinguished by uncommon personal beauty, and is said, moreover, to have strikingly resembled the Bonaparte family. The fame of Napoleon ensured for his brother Jerome a distinguished reception in America, and wherever he went he was most hospitably entertained. On visiting Baltimore he saw Miss Patterson, and soon became much attached to her, a partiality which she readily returned, and being ambitious in her views of life, she at once accepted his offer of marriage, and was united to him 24 Dec. 1803. The marriage ceremony was performed by the bishop of Baltimore, John Carroll, brother of Charles Carroll of Carrollton, the signer of the Declaration of Independence, and in accordance with the ritual of the Roman Catholic Church. The marriage contract, considered of importance, was drawn up by Alexander J. Dallas, subsequently Secretary of the Treasury, and witnessed by several official personages, including the mayor of Baltimore. Jerome Bonaparte remained in America for a full year, visiting, with his wife, various parts of the country. They embarked for Europe in the spring of 1805, in the American ship *Erin,* and arrived safely at Lisbon. The news of the marriage proved very distasteful to the dictator of France, partly because Jerome had dared to marry without his consent, and partly on account of his own wish to unite all his brothers to European princesses. Before the newly wedded pair could reach Europe an order went forth to every port under French authority forbidding them to land. The hopes of the fair American were now forever blighted, as Napoleon sternly refused to recognize her marriage. Jerome left her at Lisbon and hastened to Paris, hoping by a personal interview to soften the Emperor, directing the vessel to proceed to Amsterdam, as the state of his wife's health would not admit of her undergoing a long land journey, even if a passport could be obtained for her, which was very doubtful. On the *Erin's* arrival at Texel roads, Madame Bonaparte found that an order had been awaiting her coming, which prohibited her from landing. She was obliged to sail at once for England, where she established her abode, and at Camberwell, near London, gave birth to a son. She never saw her husband again, except in a casual meeting many years after their separation. Jerome, who was originally much attached to his wife, in vain petitioned the Emperor to recognize her, and was finally obliged to marry the Princess of Würtemberg. After the downfall of Napoleon, Madame Patterson (as she was styled for a long period) visited Europe, and is said to have encountered Jerome Bonaparte with his wife in the gallery of the Pitti Palace in Florence. On meeting, Jerome started aside, and was overheard to say to the Princess: «That lady is my former wife.» He instantly left the gallery, and next morning departed from Florence. Napoleon I never succeeded in inducing Pope Pius VII to declare Jerome's first marriage null and void. Madame Bonaparte, after the birth of her son, generally resided in Baltimore, in the possession of abundant wealth. Notwithstanding her treatment by Napoleon, she always expressed the highest admiration for him, and prophesied that her grandson would eventually succeed him as Emperor of the French. JEROME NAPOLEON, son of the preceding: b. Camberwell, England, 7 July 1805; d. Baltimore, 17 June 1870. His mother returned to the United States during his boyhood, and he was raised in Baltimore. He entered Harvard College, and graduated from that institution in 1826. He studied for the bar, but never practised law. He was married to Miss Susan Mary Williams, daughter of Benjamin Williams, originally of Roxbury, Mass. Miss Williams was a lady of very large fortune, which, united with Bonaparte's own property, made him one of the wealthiest citizens of Baltimore. After his marriage he devoted his time to the management of a large estate, and partly to agricultural pursuits. For many years, Bonaparte received a handsome allowance from his father, with whom he was on terms of intimacy in his several visits to Europe. During the reign of Louis Philippe, Bonaparte was permitted to sojourn in Paris, but for a short period only, and under his mother's name of Patterson. Although traveling *incognito*, he attracted much attention from his singular likeness to the great Emperor. He was thought to resemble him more than any of the monarch's own brothers did. He was on good terms with Napoleon III, and visited the French court with his son, by the invitation of the Emperor. Bonaparte tested his legal standing in the French courts by lodging a claim to share with the offspring of the second marriage in the property of his father; but judgment was given against him. JEROME NAPOLEON, grandson of Jerome Bonaparte: b. Baltimore, 5 Nov. 1832; d. Pride's Crossing, Mass., 4 Sept. 1893. He was educated at Harvard College and West Point Military Academy, but resigned his commission in the United States army to enter the French service in 1854. He served with distinction in the Crimean War and in the Italian campaign. CHARLES JOSEPH, grandson of Jerome Bonaparte: b. Baltimore, 9 June 1851; d. there, 28 June 1921. He was graduated from Harvard University in 1871 and the Harvard Law School in 1874. In 1904 he was appointed a member of the Board of Indian Commissioners. In 1905 he was appointed Secretary of the Navy by President Roosevelt and in 1906 became Attorney-General, remaining in this position until 5 March 1909. Was trustee of Catholic University from 1904, and a member of the council of National Civil Service Reform League.

BONAR, Andrew Alexander, Scotch ecclesiastical writer: b. Edinburgh 29 May 1810; d. Glasgow, 30 Dec. 1892. He studied theology in his native place and became minister at Collace (1838–56) and of the Finnieston Church, Glasgow (1856–92). He joined the Free Church in 1843 and became moderator in 1878. He visited Palestine, in company with R. M. McCheyne, in 1839 to inquire into the condition of the Jews there, and he embodied the result of his investigations in 'A Narrative of a Mission of Inquiry to the Jews from the Church of Scotland in 1839' (Edinburgh 1842). Among his other published works are a biography of R. M. McCheyne (1845); 'Commentary on Leviticus' (1846); 'Redemption Drawing Nigh' (1847); 'Christ and His Church in the Book of Psalms' (1859); and many minor biographies, tracts, pamphlets and controversial articles. A. A. Bonar was a younger brother of Horatius Bonar (q.v.).

BONAR, Horatius, Scottish ecclesiastical writer and elder brother of A. A. Bonar (q.v.): b. Edinburgh, 19 Dec. 1808; d. Edinburgh, 31 July 1889. He was educated in his native city where he studied theology and became minister at Kelso (1837–66) and at the Chalmers Memorial Church, Edinburgh (1866–89). Like his brother he went over to the Free Church in 1843, and like him he was also a pronounced premillenarian and his views run all through his works, among the principal of which are 'Prophetical Landmarks' (London 1847); 'The Night of Weeping' (1846); 'God's Way of Peace' (1862); 'The White Fields of France' (1879); and 'Life and Work of G. T. Dodds' (1884). Much of his miscellaneous work appeared in the *Quarterly Journal of Prophecy*, which he founded in 1849. He is best known as a hymn writer. His poetical works appeared in four different editions: 'Hymns of Faith and Hope' (3 vols., 1857–66); 'The Song of the New Creation and Other Pieces' (1872); 'Hymn of the Nativity' (1878); 'Songs of Love and Joy' (1888); 'Until the Daybreak and Other Hymns' (1890).

BONAR LAW, A. See LAW, ANDREW BONAR.

BONASONE, bō-nä-sō'nā, **Giulio,** Italian painter: b. Bologna 1510; d. 1574. He studied under Marcantonio Raimondi, but did not equal his master in execution. Although best known by his engravings, which reproduce the works of Raphael, Michelangelo and Giulio Romano, specimens of his paintings are to be found in the churches of his native city.

BONASUS, a species of wild ox, the aurochs (q.v.).

BONAVENTURA, Saint (properly JOHN OF FIDANZA), Italian philosopher: b. Tuscany 1221; d. 1274. In 1243 (or 1248) he became a Franciscan monk; in 1253 teacher of theology at Paris, where he had studied; in 1256 general of his order, which he ruled with a prudent mixture of gentleness and firmness. At the time of his death he was a cardinal and papal legate at the Council of Lyons. His death was hastened by his ascetic severities. On account of his blameless conduct from his earliest youth, and of some miracles ascribed to him, he enjoyed during his life the greatest veneration, and was canonized by Pope Sixtus IV. The elevation of thought in his writings procured him the name of "The Seraphic Doctor." The Franciscans oppose him as their hero to the Dominican scholastic Thomas Aquinas. He wrote for the honor and improvement of his order, for the promotion of the worship of the Virgin, on celibacy, transubstantiation and other doctrines. He is, on the whole, distinguished from other scholastics by perspicuity, avoidance of useless subtleties and greater warmth of religious feeling. Among his writings are 'Itinerarium Mentis in Deum'; 'Reductio Artium in Theologiam'; 'Centiloquium'; and 'Breviloquium.' His whole works were published 1588–96, at Rome, in seven folio volumes, and there are several modern editions. Many pieces attributed to him are not genuine.

BONAVISTA, Newfoundland, the name of a bay, cape, district and town on the east coast of the island. The greatest width of the bay is 39 miles. Navigation is rendered dangerous by the rocky islands with which it is studded. There is a lighthouse at the entrance of the harbor. The town stands near the cape, about 70 miles north by west of Saint John's, is a port of entry and one of the oldest fishing stations in Newfoundland. Pop. (1911) 3,971.

BONBRIGHT, Daniel, American educator: b. Youngstown, Pa., 1831; d. 28 Nov. 1912. He was graduated at Yale (1850) and was tutor there (1854–56). Between 1856 and 1858 he studied at the universities of Berlin, Bonn and Göttingen, and upon his return to America became professor of the Latin language and literature in Northwestern University, Evanston, Ill. From 1899–1902 he was dean of the faculty of liberal arts. During 1900–02 he was acting president of the university.

BONCHAMP, bŏṅ-shäṅ, **Charles Melchior Artus,** (Marquis de, mär-kē dė), Vendean leader: b. Anjou, 10 May 1760; d. 17 Oct. 1793. He served as a volunteer in the American Revolutionary War, and was a captain in the French army at the outbreak of the French Revolution. A strong Royalist, he naturally disliked the Revolution, and consequently lived in retirement until chosen leader of the Anjou insurgents. In conjunction with La Rochejacquelein and Cathelineau he fought with great bravery and frequent success, but his superior knowledge of military tactics was not sufficiently made use of by the insurgent army. In the encounter at Cholet, 17 Oct. 1793, Bonchamp received a fatal shot in the breast, and when his followers vowed to avenge his death on 5,000 Republican prisoners, the dying hero exclaimed: «Spare your prisoners. I command it!» This last command was obeyed.

BONCI, bon'chē, **Alessandro,** Italian tenor: b. Cesena in the Romagna 1870. After early training and successes in Italy and later in the great European capitals, in 1906 he came to New York as principal tenor of Hammerstein's Manhattan Opera House, and in 1908 was engaged by the Metropolitan Opera Company. In 1910 he resigned and took up concert work. Endowed with a perfectly trained voice of beautiful quality and flexibility he is considered by many critics the best modern exponent of bel canto.

BOND, Sir **Edward Augustus,** English scholar: b. Hanwell 1815; d. 1898. In 1867 he was placed over one of the departments of the British Museum, and in 1878 became head librarian, retaining the post for 10 years. He was one of the founders and for many years the president of the Palæological Society, editing in this connection 'Facsimiles of Ancient Charters in the British Museum' (1873).

BOND, George Phillips, American astronomer (son of William Cranch Bond, q.v.): b. Dorchester, Mass., 20 May 1825; d. 17 Feb. 1865. He assisted his father in the Harvard College Observatory, and at the time of the latter's death was appointed director. He discovered independently 11 new comets, and was the author of an elaborate memoir on the appearance of Donati's comet in 1858, and of important investigations on the subject of perturbations of cometary orbits, as well as an investigation into the theory of the constitution of Saturn's rings. His drawing of the nebula in Orion, of which a fine steel-plate engraving was made, was also remarkable work, and astronomical photography received its first impulse at his hands.

BOND, Sir **Robert,** Newfoundland statesman: b. Saint John's, N. F., 25 Feb. 1857. He was educated at Queen's College, Taunton, England; entered the Newfoundland legislature in 1882; elected speaker 1884; was Colonial Secretary 1889–97; and has been Premier and Colonial Secretary since 1900. He negotiated the Bond-Blaine convention of 1892, and the Hay-Bond Treaty of 1902, providing for reciprocity with the United States, both of which failed to secure ratification. He is opposed to the incorporation of the colony in the Dominion of Canada, and was created K.C.M.G. in 1901.

BOND, William Bennett, Canadian clergyman: b. Truro, England, 10 Sept. 1815; d. 1906. He was appointed rector of Saint George's Church, Montreal, 1862; was consecrated Anglican bishop of Montreal, 25 Jan. 1879; in 1901 he became archbishop and metropolitan of Canada, and in 1904 primate of all Canada.

BOND, William Cranch, American astronomer: b. Portland, Me., 9 Sept. 1789; d. 29 Jan. 1859. Beginning as a watchmaker, he constructed the first ship's chronometer made in the United States. He established a private observatory at Dorchester, Mass., which was at the time the finest in the country. Invited to move his observatory to Cambridge, he accepted the invitation of the Harvard College authorities, and in 1840 was appointed astronomical observer to the college, and later to the directorship of the observatory erected there in 1843–44. He was the inventor of the method of registering the beats of a clock by galvanic circuit, together with the observed transits of stars over the wires of a transit instrument, upon a chronograph, and he invented the spring governor, in which part of a train of clockwork is regulated by a pendulum with a dead-beat escapement, and the other, receiving its motion through an elastic axis, is made to run uniformly by a balance- or fly-wheel, and thus time is visibly measured to a small fraction of a second. The plan of recording observations by electro-magnetism, known in Europe as the American method, was first brought into practical working by Sears C. Walker, through Bond's assistance.

BOND. See Building; Masonry.

BOND, a written acknowledgment or binding of a debt under seal. The person who gives the bond is called the obligor, and he to whom it is given the obligee. A bond may be single, as where the obligor obliges himself, his heirs, executors and administrators, to pay a certain sum of money to another at a day named, or it may be conditional (which is the kind more generally used) that if the obligor does some particular act, the obligation shall be void, or else shall remain in full force, as payment of rent, performance of covenants in a deed, or repayment of a principal sum of money borrowed of the obligee with interest, which principal sum is usually half of the penal sum specified in the bond. There must be proper parties, and no person can take the benefit of a bond, except the parties named therein, except, perhaps, in some cases of bonds given for the performance of their duties by certain classes of public officers. A man cannot be bound to himself even in connection with others. The bond must be in writing and sealed, but a sealing sufficient where the bond is made is held sufficient though it might be an insufficient sealing if it had been made where it is sued on. It must be delivered by the party whose bond it is to the other. But the delivery and acceptance may be by attorney. The date is not considered of the substance of a bond, and therefore a bond which has either no date or an impossible date is still valid, provided the real day of its being dated or given can be proven. The condition is a vital part of a conditional bond, and usually limits and determines the amount to be paid in case of a breach, but interest and costs may be added (12 Johns. 350). The recovery against a surety in a bond for the payment of money is not limited to the penalty, but may exceed so far as necessary to include interest from the time of the breach. So far as interest is payable by the terms of the contract, and until default made, it is limited by the penalty, but after breach it is recoverable, not on the ground of contract, but as damages, which the law gives for its violation. On the forfeiture of the bond, or its becoming single, the whole penalty was formerly recoverable at law, but here the courts of equity interfered, and would not permit a man to take more than in conscience he ought, that is, his principal, interest and expenses in case the forfeiture accrued by non-payment of money borrowed, the damages sustained upon non-performance of covenants, etc. And the similar practice having gained some footing in the courts of law, the statute of 4 and 5 Anne, c. 16, at length enacted, in the same spirit of equity, that in case of a bond conditioned for the payment of money, the payment or tender of the principal sum due with interest and costs, even though the bond were forfeited and a suit commenced thereon, should be a full satisfaction and discharge (2 Bl. Com. 340). If in a bond the obligor binds himself without adding his heirs, executors and administrators, the executors and administrators are bound, but not the heir (Sheppard's Touchstone, 369), for the law will not imply the obligation upon the heir (Coke, Litt. 209*a*). If a bond lie dormant for 20 years it cannot afterward be recovered; for the law raises a presumption of its having been paid, and the defendant may plead *solvit ad diem* to an action upon it (1 Burr. 434; 4 Burr. 1963). When chartered most corporations are empowered to issue bonds, which must bear a fixed interest and run for a definite period. Such bonds are either registered or coupon bonds, the former issued to individual owners listed on the corporation's books who when disposing of them, must authorize the transfer to the purchaser. Coupon bonds are payable to bearer and attached to them are a series of coupons, which are promises of the payment of interest at stated periods. These coupons as they fall due are cut from the bond and presented for payment. Corporation bond issues are often secured by a mortgage made to a trustee for the bondholders on the property of the issuing corporation, and which may be foreclosed in the usual way upon default of payment.

Government bonds are not secured by any mortgage and their security rests upon the confidence of the purchaser in the issuing government. In many States the bonds of the State government and in all States the issues of school, county and city bonds are covered by constitutional provisions which impose a limit to indebtedness through bond issues. See Bonds, Investment; and consult Cook, 'Treatise on Stock and Stockholders' (3d ed., Chicago 1894); Dillon, 'Law of Municipal Bonds' (Saint Louis 1876); Hainer, 'Modern Law of Municipal Securities' (Indianapolis 1898); Short, 'Law of Railway Bonds and Mortgages' (Boston 1897).

BONDAGE. See Villeins.

BONDED WAREHOUSE, a place where taxable imports or manufactures may be left in government custody, under bond for payment of the duty, till the importer or manufacturer is prepared to make full payment of duty. The system was designed to promote commerce and certain manufactures by lessening the pressure on the importer or manufacturer by means of instalment payments of duty.

BONDERS, a class of independent landholders in Norway and Sweden. They are at once burgesses and aristocrats, being descended from the old leaders, and sometimes from the princes, of the nation, yet being also cultivators of the soil, they equal in rank the farmers of America or the yeomen of England. They number seven-ninths of the whole population, and are the principal electors of representatives to the National Assembly, in which their power predominates over that of the nobles and clergy.

BONDI, bŏn'dē, **Clemente**, Italian poet: b. Mizzano, Parma, 1742; d. Vienna, 20 June 1821. Joining the Jesuits shortly before the suppression of the order in Italy, he was appointed professor of eloquence in the University of Parma. He afterward provoked the hostility of the order by publishing an ode in praise of their suppression, and was obliged to seek an asylum in the Tyrol, where the Archduke Ferdinand took him under his protection, appointed him his librarian at Brünn, and entrusted him with the education of his sons, one of whom afterward succeeded to the duchy of Modena. In 1816 Bondi was appointed professor of history and literature at Vienna and died there. He was an easy and elegant versifier, and cultivated with success almost all the varieties of poetry — lyric, didactic, satirical and elegiac. Among the most important are 'La Giornata Villereccia,' 'La Conversazione' and 'La Felicità.' He also executed a metrical version of the Æneid, which some consider his best work.

BONDMAN, The, one of Hall Caine's best-known romances (1890), abounding in action and variety. The action turns upon the blind attempts of a young man at doing new wrongs to revenge old ones, which are overruled by Providence for good; and at the last, no longer against his will but by the development of his own nature, he fulfills his destiny of blessing those he has sworn to undo.

BONDS, Investment.— Investment bonds are usually classified under the following general heads: Government, Municipal, Railroad, Public Utility, Industrial.

Government Bonds.— As indicated by the name, a government bond is a bond issued by a government in exchange for money borrowed. For the prompt payment of its bonds a government pledges its full faith and credit, and such a bond usually has back of it the unlimited power of the government to levy taxes to provide funds for the payment of principal and interest.

Municipal Bonds.— Under the heading Municipal bonds there are usually grouped not only the bonds of cities but also those of other political divisions, such as counties, school districts, townships, etc., and even including bonds of the States themselves. There are sometimes issued by cities, towns, etc., what are known as special assessment bonds payable by their terms solely from the levy of special taxes on certain property benefited by the improvement for which the bonds were issued, but generally speaking Municipal bonds are issued as the direct obligation of the entire municipality and all of the property within the municipality is subject to the levy of sufficient taxes to pay principal and interest of the bonds. In nearly all of the States of the United States there are constitutional limitations governing the amount of bonds which may be issued by the cities, counties, etc., within the State, the limitations being usually a certain percentage of the assessed valuation of taxable property, but it is sometimes provided that the limitations of debt shall not apply to bonds issued by a city for the construction or purchase of a supporting property, for example, a water system, docks, etc. In addition to the constitutional or statutory limitations of the amount of indebtedness which may be incurred, the issuance of Municipal bonds is further safeguarded in most of the States by laws which carefully prescribe the purposes for which they may be issued as well as the steps which must be taken by the properly constituted authorities preliminary to and in connection with the issuance of the bonds, including, in most cases, the holding of an election and the levying of a tax to provide for payment of principal and interest and advertisement of the bonds for some specified time. Municipal bonds are free from the operation of the Federal Income Tax Law, and in many States Municipal bonds, issued within the State, are free from personal property tax.

Railroad Bonds.— Railroad bonds constitute the best known and most widely distributed type of bond issued by corporations. Practically all of the railroad systems in the United States have bonds outstanding, and through the medium of their bond issues they obtain a large part of the money used in the construction of their properties. These bonds are held in large amounts by savings banks, national banks, trust companies, insurance companies and private investors. In addition to their bonds secured by mortgage on the railroad property, some of the roads have outstanding a type of obligation known as Equipment bonds secured on certain of their cars or locomotives. An issue of Equipment bonds is usually paid off in annual or semi-annual instalments covering a period of from 10 to 20 years.

Public Utility.— During the past 25 years in which there has been such a marked development and expansion of the properties supplying street railway, gas, electric light and telephone service, the bonds of companies supplying these public necessities have become widely known as a proper channel for conservative investment. A large number of States have had for some years public service commissions which not only supervise the general operation of public utilities in the matter of the character of service, rates, etc., but also have authority to pass upon the issuance of securities by such companies. In States having public service commissions with jurisdiction extending to the issuance of securities, the public utility companies may issue bonds only in such amounts and for such purposes and at such prices as the commission may approve.

Industrial.— Under this heading are grouped the bonds of nearly all corporations except railroads and public utilities, as, for example, the United States Steel Corporation.

Designation, How Secured, etc.— Municipal bonds usually bear a designation indicating the purpose for which they were issued, as for example, water works bonds, school building, refunding, etc. Bonds issued by corporations also usualy bear a designation, as for example, first mortgage, refunding mortgage, general mortgage, etc. The body of a Municipal bond in addition to acknowledging receipt of the face amount of the bond, and the promise to repay that amount on a certain date, contains a reference to the law under authority of which the bond is issued, the purpose of issue and a statement that it is one of a certain number of bonds aggregating a certain amount. It states the time and place of payment of the principal and interest. The bond is ordinarily payable to bearer and the coupons attached representing the interest payments (usually semi-annual) are also payable to bearer. The bond is of course signed by the proper officials and bears the seal of the municipality. A fully registered bond is one which, instead of being payable to bearer, is payable to the designated owner. No interest coupons are attached to a fully registered bond, the interest being payable by check to the registered owner. Bonds are also sometimes registered «as to principal only,» the bearer interest coupons being left attached to the bonds.

Bonds issued by the railroads and other corporations are also usually in the denomination of $1,000 in coupon form payable to bearer, although in many cases provision is made for issuing bonds fully registered or registered as to principal if desired by the holder.

Bonds issued by corporations are usually secured by a mortgage on the property of the company, a trust company being named in the mortgage as trustee for the bondholder. For example, the board of directors of a company which does an electric light and power business may authorize an issue of $50,000,000 5 per cent bonds to be secured by mortgage on its property. Perhaps $5,000,000 of the bonds will be issued and sold, the remaining $45,000,000 bonds being held unexecuted and unissued by the trustee. The mortgage may provide that additional bonds may be issued, for example, to cover 75 per cent of the cost of future additions and extensions to the property usually with certain conditions that no additional bonds may be put out unless the company is earning a certain surplus over and above its interest charges. If in connection with the growth and development of its business, the company later on expends, for instance, an additional $1,000,000 for new construction and its earnings have met the requirements of the mortgage, the trustee on presentation of the proper certificates would certify an additional $750,000 bonds and deliver them to the company to be sold to its bankers.

Walter E. Bell,
Of Harris, Forbes & Co., New York.

BONDU, bŏn-doo, a country of West Africa, belonging to the French territory of Senegal, on the west of the Falémé, a tributary of that river. Its length is about 115 miles, its breadth about 100. Its surface is but little diversified, and the land as a whole is not very fertile, nor is the climate good. The ordinary African animals occur, but the lion is scarce. The ass is the chief domestic animal. The population, which consists of Fulahs and other tribes, is rather sparse, having been reduced by frequent wars, but under French rule the country is prospering and the population, numbering about 30,000, is increasing. Along well-watered river lands agriculture is being developed; crops of corn, cotton, rice, and millet are produced, and indigo is exported. The natives wear cotton fabrics; gold and iron ores abound, and mining operations are increasing. Mohammedanism is the prevailing religion. Bulibani, the capital and the residence of the native King, has a population of about 2,500.

BONDUCA, a tragedy by John Fletcher (1579–1625), published in 1647. Its title was changed several times after its first production, which occurred before 1619. One of these titles was ‘Caractacus’; the plot of the tragedy deals with Queen Boadicea's futile defense of Britain against the Roman legions of Suetonius Paulinus. The title ‘Bonduca’ has also been used dramas by Charles Hopkins (1697) and Richard Glover (1753).

BONDY, Forest of, France, an historical wooded region outside the northern walls of Paris, frequent allusions to which are found in French literature. It was formerly a notorious haunt of bandits. The powder factory of Sevran is located here and as an outpost Fort Auberviliers commands all the approaches to Paris north of the forest.

BONE. See Bona.

BONE, the compact hard material making up the skeleton of mammals, most of the birds, reptiles and amphibians, and the bony fishes. It is also found in some lower forms. Chemically bone is complex. It is essentially organic substances, 30 to 35 per cent, infiltrated with inorganic mineral salts, 65 to 70 per cent; to the former its toughness is due and to the latter its hardness. The organic substances of bone are ossein (collagen, gelatine), small quantities of elastin, proteids and nuclein from the cells and small quantities of fat. The inorganic salts are calcium carbonate, calcium phosphate, calcium fluoride, magnesium phosphate, calcium chloride and small quantities of sulphates and other chlorides. The percentages of both inorganic and organic constituents vary widely in the bones of different animals, and also in the different bones of the same animal. These differences vary widely if the age varies, but are fairly constant for the same animal of the same age. Thus the amount of water may vary from 13 to 45 per cent in the different bones of the human body, being greater in amount in the spongy bones and less in the compact bones, and as the bones grow older the percentage of water diminishes. In the living body many of the bones, particularly the ribs, and the heads of all the long bones, contain a substance termed marrow. This is an important substance in the human economy, being the source of much of the blood-building material. In soups this marrow makes one of the most important factors. This bone marrow is pervaded by a network of white fibrous connective tissue and in the meshes are contained the cells, myeloplaxes, that make many of the blood corpuscles, particularly the pólymorph neutrophiles and the eosinophiles. In the red marrow the red corpuscles are developed. The bone marrow is very rich in proteids, nucleo-proteids, extractives, globulins, fats and compounds of iron. Prepared bone marrows are therefore highly nutritious, and the modern «grilled bone,» which is usually rich in marrow, is a toothsome and valuable dietary addition. The histological structure of bone is very intricate; in the young developing animal, cartilage first makes its appearance from modified connective tissue cells. In this cartilage certain points of ossification appear, which subsequently develop bone and the bone from several points coalesces to make the completed bone structure. The bone cells in the cartilage, the osteoblasts, thicken and form a distinct cell wall in which the inorganic salts are deposited and osteoblast by osteoblast the structure of bone is made up. Bone is also formed by the periosteum, which is a covering, first of the cartilage and then of the developing bone. Bony tissue contains arteries, veins, nerves and lymphatics, and is a distinct tissue, largely modified by the deposition of mineral salts. In a section across a long bone, at its centre, say the thigh bone or femur, there is on the outside the thin tough layer, the periosteum with its vessels and nerves and lymphatics; within this is the compact bone and in the centre the cavity usually filled with marrow at the ends. A very thin section of the compact bone viewed under the microscope shows a number of cavities, the Haversian canals; these contain blood vessels or were the sites of former blood vessels in the developmental stage. Around these Haversian canals, one sees regular lamellæ, not unlike the rings about a tree trunk; these are the Haversian lamellæ and indicate the regular growth of bone cells from the centre. Scattered between the lamellæ are numerous small spaces, containing living bone cells, the lacunæ, all of which are probably in communication with one another by minute canals, or canaliculi. Thus the entire bony system is pierced throughout by an extremely fine and exceedingly rich network of canals. As these are filled with lymph the bone substance is constantly bathed in this living life-giving fluid. The different bones of the body show minor variations in structure. The bones of the human body are grouped according to their shape, as long bones, flat bones, short and irregular bones. They approach one another at the joints, where they are protected by cartilages, smooth synovial membrane, and bathed in a synovial fluid. The long bones consist of a shaft and two expanded ends or epiphyses, and are found in the limbs. They give support and leverage for motion and are usually slightly curved in one or two directions to give greater elasticity. Flat bones are found in the skull, pelvis, scapula, and are usually so disposed as to afford protection to the internal viscera; they also offer considerable surface for muscular attachment and hence give a good leverage for the long bones. Short bones are found in the wrist and ankle. Strength and freedom of motion are their attributes. Irregular and mixed bones are the vertebræ and some of the bones of the skull. They each have varied and specially adaptive functions. Many bones, especially those of the skull, are composite. They develop separately, and finally unite. Thus the bones of the skull are separated until late in life, and in some individuals, some of the bones never develop thoroughly. This is frequently the case in the growth of the lower jaw, where failure to unite produces the well-known deformity of cleft palate or hare lip.

Bone is slightly heavier than water, its specific gravity varying from 1.80 to 1.90. The spongy bones, because of the large amount of air contained, float in water. The bones of birds are remarkable for their strength and lightness. The twofold nature of bones is readily demonstrated by two simple experiments: If one bone is placed in acid, 20 per cent hydrochloric, the acid will attack and dissolve out the mineral salts, after which the bone may be bent and its shape altered at pleasure, nothing but the organic matter remains; another similar bone may be placed in a furnace and the heat will burn out the organic matter entirely; that which remains will be the mineral matter. It will retain the shape of the original bone, will be white, but will break down into powder at the least pressure.

Uses of the Bones.— In dietetics bones make a substratum for soups. These are important carriers of salts to the body. As for the gelatine alone, it is a tissue sparer, the body cannot use it for purposes of anabolism, but it spares katabolism of proteids. It is a useful menstruum for foodstuffs. Bone marrow is highly nutritious, contains iron and is a superlative food, and thought to be particularly valuable as a blood maker. The uses of bone in the arts are numerous. See FERTILIZERS. Consult Syminowitch, 'Histology'; Gray, 'Anatomy'; MacEwen, 'Growth of Bone' (New York 1912). See ANATOMY; KINETOGENESIS; OSTEOLOGY.

BONE BLACK. See BLACKS.

BONE-CAVES, caverns containing deposits in which are embedded large quantities of the bones of animals (many of them extinct), dating from the Pleiocene or later geologic periods. See CAVE.

BONE DISEASES. See OSTEOMYELITIS; PERIOSTITIS; OSTEITIS.

BONE-DOG. See BONE-SHARK; DOG-FISH.

BONE-DUST, bones ground to dust to be used as manure. See FERTILIZERS.

BONE-FISH. See LADY-FISH.

BONE-SHARK, or **BASKING-SHARK,** a comparatively rare species of pelagic shark, found in the Arctic seas, and southward as far as Portugal and New York. It obtains the name «bone-shark» from the resemblance of its slender, long and close-set gill-rakers to whalebone. It is also known as «basking-shark,» because of its habit of remaining quiet for hours in one place. It reaches a length of 40 feet and its skin is rough and covered with small spikes. It is usually seen in the brooding season, sluggishly swimming in groups, on the surface of the water, and undisturbed by the approach of boats.

BONEBREAKER, the great fulmar-petrel (*Ossifraga gigantea*) of the islands and coasts of the south Pacific and Atlantic oceans. It is as large as the albatross, and feeds mainly upon the carcasses of dead seals and cetaceans, whose bones it is capable of breaking with its vulture-like beak.

BONER, Ulrich, the most ancient Swiss fabulist, a Dominican friar at Bern, in the first half of the 14th century. His collection of fables under the title 'Der Edelstein' ('The Gem'), is distinguished by purity of language and picturesque simplicity of description. The first editions of these fables were by Bodmer and Eschenburg. Benecke published a very good edition with explanatory notes and an excellent vocabulary (1816); that of Pfeiffer appeared in 1844, and a recent imprint is found in Reclam's 'Universal Bibliothek' (1895).

BONESET, or **THOROUGHWORT** (*Eupatorium perfoliatum*), a stout, ill-smelling perennial herb of the natural order *Compositæ,* native of America, common in moist soils. The plants, which attain a height of sometimes eight feet, are often planted as ornamentals in low ground. In midsummer when the profusion of purplish or white flowers are in full blow they are striking objects. The foliage and flowers have been used as tonic and sudorific in domestic medicine; their intensely bitter taste also acts as an emetic. See EUPATORIUM.

BO'NESS, a contraction of the older form Borrowstounness, a parish and seaport in Linlithgowshire, Scotland, distant 24 miles west by north of Edinburgh by rail. It is situated on a low peninsula washed by the Forth, and possesses three principal streets running from west to east, one of them a continuation of the other two. The chief industrial establishments are potteries, iron foundries, engineering shops, chemical manure works, sawmills, timber yards, salt works, distilleriess, brick fields, etc., and in the vicinity are very extensive collieries. A new dock has recently been constructed and the old harbor improved, hydraulic hoists and other appliances being provided. Adjacent to Bo'ness are remains of the Roman wall of Antoninus. Pop. 10,862.

BONET, bō-nĕt', **Juan Pablo,** Spanish teacher of the deaf and dumb of the 17th century, distinguished as one of the earliest teachers of this class, and the author of a remarkable work, 'Reducción de las letras y artes para enseñar á hablar á los mudos,' published in Madrid, 1620. It explained his method of instruction, containing the first alphabet for the deaf and dumb, and was of good service to Dalgarno, Wallis, and, a century later, to the Abbé de l'Epée, who acknowledged his indebtedness to Bonet's labors.

BONET-MAURY, bo'nĕ-mō'rē', **Amy-Gaston-Charles-Auguste,** French Protestant divine and author: b. Paris, 1842. A student of the Lycée Henri IV, Paris, and in Geneva and Strassburg, from 1868 to 1872, he was pastor of Walloon churches in Belgium and of churches at Beauvais and Saint-Denis. In 1879 he was appointed lecturer in church history in the Paris Protestant School of Divinity, and later as librarian of the Musée Pédagogique was active in making the history of French Protestantism better known. He is the author of numerous books including ‘Rôle des hérésies au moyen âge’ (1879); ‘Arnauld de Brescia, unreformateur au XII^{e} siècle’ (1881); ‘Origines du christianisme unitaire chez les Anglais’ (1881); ‘Le Congrès des religions à Chicago en 1893’ (1895); ‘Histoire de la liberté de conscience depuis l'édit de Nantes jusqu 'à juillet 1870’ (1900); ‘L'Islamisme et le Christianisme en Afrique’ (1906); L'unité morale des religions’ (1912).

BONFIGLIO, bōn-fē'lyō, or **BUONFIGLIO, Benedetto,** Italian painter: b. 1425(?); d. 1496 (?). His chief work was the frescoes of the Palazzo Comunale at Perugia, where he lived. These frescoes placed him in the first rank of the painters of the Umbrian school. It is believed that he also assisted Pinturicchio in decorating the Vatican.

BONGABONG, Philippines, a town in the southeast part of Luzon. It lies in a mountainous district, and attained military importance as the headquarters of a United States regiment. The town has a municipal government based upon popular election. Pop. about 23,000.

BONGAR, bŏn'gär, a serpent of the genus Bungarus. See KRAIT.

BONGHI, Ruggero, rood-jā'rō bōn'gẹ, Italian scholar and publicist: b. Naples, 21 March 1828; d. near Naples, 22 Oct. 1895. The commencement of his brilliant career indicated scholarly activities only, for he made fine studies and versions of Aristotle and Plato; but latterly he took up such subjects as ‘The Financial History of Italy, 1864–68’ (1868); ‘The Life and Times of Valentino Pasini’ (1867); ‘Pius IX and the Future Pope’ (1877); ‘History of Rome’ (1884), and ‘The Life of Jesus’ (1890); ‘The Roman Festivals’ (1891); the popularity and value of these and other works giving him great prominence. He held professorships in several Italian universities; was Minister of Public Instruction in 1874–76; was a member of the Chamber of Deputies nearly continuously from 1860; founded the *Stampa,* the leading Turin journal, and the magazine *Cultura,* of which he was editor at the time of his death; and presided over the International Peace Congress held in Rome in 1891.

BONGO, or **OBONGO,** the name of a negroid people in the basin of the Ogowe River, in the French Kongo. They live by the chase, grazing and agriculture, and are skilled workers in iron.

BONGO, a large West African bushbuck (q.v.).

BONHAM, bŏn-ạm, **Milledge L.,** American lawyer and soldier: b. Edgefield, S. C., 25 Dec. 1815; d. White Sulphur Springs, N. C., 27 Aug. 1890. He was graduated at South Carolina College, 1834; was admitted to the bar 1837, and served as a representative in Congress 1840–44. In 1836 he was major and adjutant-general of the South Carolina Brigade in the Seminole war in Florida, and colonel of the 12th United States Infantry during the Mexican War. In 1856 he was elected to Congress as a State Rights Democrat, and re-elected in 1858, but left Congress 21 Dec. 1860, when the South Carolina delegation withdrew. Commissioned a brigadier in the Confederate army, 19 April 1861; he commanded Beauregard's centre at the first battle of Manassas, but gave up his commission to enter the Confederate Congress, 27 Jan. 1862. He was governor of South Carolina 1862–64, when he was again commissioned a brigadier-general, and was serving with General Johnston at the time of the latter's surrender. In 1868 he was a delegate to the National Democratic Convention in New York.

BONHAM, Tex., town and county-seat of Fannin County, situated on the Texas & P. and the Denison, Bonham & New Orleans railways, 75 miles northeast of Dallas. It is the seat of Carlton College and the Masonic Female Institute. As the centre of an agricultural region it has a large export trade, especially in cotton, fruit, grain, flour and live stock. Its chief manufacturing industries are flour mills, cotton-gins, machine shops, carriage and wagon factories, tobacco factories, a creamery, ice factory, planing mills. Pop. (1920) 6,008.

BONHEUR, bō-nėr, **François Auguste,** French painter, brother of Rosa Bonheur: b. Bordeaux, 4 Nov. 1824; d. 23 Feb. 1884. The beauty of his landscapes has been much praised. He was made Chevalier of the Legion of Honor in 1867 and received numerous medals.

BONHEUR, Jules Isadore, French painter and sculptor, brother of Rosa Bonheur (q.v.): b. Bordeaux, 15 May 1827. In the Salon of 1848 he exhibited both paintings and sculpture but in later years confined himself to sculpture. Medals were awarded him in 1865 and 1867. Among noted works of his are ‘The Zebra and Panther’; and ‘The Tiger Hunter.’

BONHEUR, Marie Rosa, French artist of distinction, widely known as a painter of animals: b. Bordeaux, 22 March 1822; d. Fontainebleau, 25 May 1899. Of Jewish origin, she received her earliest instruction in art from her father, himself an artist of repute, and when only 18 years old exhibited at the Salon two pictures, ‘Goats and Sheep,’ and ‘Two Rabbits,’ which gave clear indications of talent. In 1849 her fine work, ‘Labourages Nivernais,’ was purchased by the French government and placed in the Luxembourg collection. In 1855 ‘The Haymaking Season in Auvergne’ was hung at the Universal Exposition in Paris, and in the same year she sent the ‘Horse Fair’ to the French Exhibition in London, where it was the centre of attraction for the season. It was offered by her to Bordeaux for $6,000, but the offer being declined it was sold in England for $20,000. It was subsequently purchased by Cornelius Vanderbilt for the Metropolitan Museum in New York. She made a quarter size replica which is now in the National Gallery in London. After this work she stood at the very head of delineators of animal life, showing a wonderful power of representing spirited action. Her work is, however, marred by a deficient sense of atmosphere. Near her studio she had an antechamber as a stable for the convenient study of animals, of which she collected some noble specimens. She also attended horse markets and fairs, generally wearing masculine dress, which was not unbecoming to her strong and marked features. After 1849 she directed the Free School of Design for Young Girls in Paris. During the siege of Paris the Crown Prince of Prussia especially ordered that her studio and residence at Fontainebleau should be spared and respected. She received a first-class medal at the French Salon in 1849 and another in 1855, and the decoration of the Legion of Honor in 1865. In 1892 a celebrated painting by her, entitled ‘Horses Threshing Corn,’ was sold for $60,000. It is the largest animal picture ever painted, showing 10 horses large as life. In 1896, on her 74th birthday, she furnished a painting representing the historical combat between two stallions to which Lord Godolphin invited his friends in 1734. Characteristic samples of her work — ‘Deer in the Forest,’ ‘A Limier-Briquet Hound’ and ‘Weaning the Calves’— are in the Metropolitan Museum of Art, New York, and ‘Deer Drinking’ is hung in the Public Library of that city. Consult Larnelle, ‘Rosa Bonheur, sa vie et ses œuvres’ (1885); Peyrol, ‘Rosa Bonheur: Her Life and Works’; Stranahan, ‘A History of French Painting’ (1899), and the monograph by Klampke (Paris 1908).

BONHOMME, bō-nŏm', **Jacques,** a term of ridicule used by the French nobility to designate the common people, especially the peasants.

BONHOMME RICHARD, the flagship of John Paul Jones (q.v.), in the most remarkable naval victory on record, 23 Sept. 1779; originally the *Duras,* a worn-out, unseaworthy merchant Indiaman assigned to him by the French government because none of their own naval officers would serve under a foreigner, and renamed by Jones from Franklin's ‘Poor Richard,’ because he obtained her by following one of its maxims. She had 21 guns on a side, mainly 12-pounders, with three 18-pounders aft near the water line; and a mongrel crew of Americans, British, Portuguese and other classes. With three other vessels in the squadron Jones intercepted, off Flamborough Head, on the east coast of England, a British fleet of naval stores from the Baltic, convoyed by the *Serapis* (Capt. Richard Pearson) and the *Countess of Scarborough.* The latter was captured by one of Jones' squadron; the former about 7 o'clock on a moonlight night joined battle with the *Richard,* having 25 guns on a side, 10 18-pounders — a much greater weight of metal than its foe, and with far more penetrating power than the 12-pounders of the American ship. To neutralize this advantage Jones' policy was to fight at close range; and in the attempt to rake the *Serapis* the two vessels swung broadside to and were lashed together by Jones, and fought the rest of the battle so close that the guns could not be run out full length, their muzzles touched and the rammers of each had to be thrust into the portholes of the other to load. Only those of the starboard side of each could be used. Two of Jones' 18-pounders burst at the first fire; his lighter guns were gradually silenced by the *Serapis;* the entire sides of his vessel were shot away, so that the *Serapis'* shot passed through without touching anything; she caught fire in several places; she had been leaking at the outset and now had several feet of water in the hold; and an under-officer in affright let the 200 or 300 British prisoners loose and ran to tear down the colors, but finding the flag-pole gone began to shriek for quarter. Lieutenant Dale with immense presence of mind set the prisoners at the pumps, not only saving a guard but releasing the pumpmen to fight; Jones broke the officer's head with a pistol-butt, and in answer to Pearson's inquiry if he was ready to surrender, replied, «I have not begun to fight yet,» though the *Serapis* was firing heavily and his own guns were nearly still. Meantime, however, the deadly musket fire from the *Richard's* top gear had made the service of the upper guns of the *Serapis* almost sure death, and they too were silenced; a cannon-shot brought down her mainmast; the combustibles thrown from the *Richard* wrapped her upper deck in fire; at last a bucket of hand-grenades flung down her hatchways set off a mass of cartridges strewn along the decks, killing or wounding nearly all those around and wrecking five guns; and just then Jones' ship, the *Alliance* — whose timid, half-insane French captain had been tacking about, occasionally firing grapeshot at random into both vessels, came near, and Pearson struck his colors, though four of his guns were still firing and his ship was sound. Jones put Dale aboard the *Serapis,* and tried to navigate the *Richard* to a friendly port; but at 9 o'clock of the 25th she had to be abandoned, and she sank about an hour later.

BONI, bō'nẹ, a district, formerly a kingdom, in the island of Celebes, Dutch East Indies, with an estimated area of about 1,000 square miles. This territory is mountainous, but, though contiguous to the great volcanic belt of the archipelago, exhibits no traces of volcanic action. Lompoo-Batang (great pillar), its highest peak, and the loftiest in Celebes, attains an elevation of 8,200 feet above the level of the sea. Lake Labaya, or, as called by the natives, Taparang-Danau, in the northwest corner of this territory, is a beautiful sheet of water, 24 miles long and 13 broad, with an average depth of six fathoms, and abounds in fish. It is bordered on all sides by a luxuriant and richly diversified tropical growth, except at the mouths of the numerous little streams that empty into it, where clearings and beautiful, picturesque little villages, attest the industry, skill and civilized tastes of the Bugis people. Boni was formerly the most powerful state in Celebes, but since 1859 has been practically a Dutch dependency. In the north the scenery is fine and the soil fertile — rice, sago, cassia, coffee and tobacco being produced. The language of the inhabitants is allied to that of the Macassars, with a literature of its own. Their towns and villages dot the coast, and as enterprising merchants and sailors the Bugis are found in every port of the East Indian Archipelago; they also engage in agriculture and horse breeding, and in the manufacture of cotton and articles of gold and iron, in which they have a large trade. They are well built, active and brave, and are lighter skinned, as well as superior in honesty and morality to other Malay races. Their institutions, said to be very ancient, partake of the character of a constitutional monarchy. The British have twice attacked the Bonese for injuring their commerce and selling the crews of British ships into slavery. In the second attack, in 1814, the Bonese King was killed. The number of the population is unknown, estimated from 200,000 to 300,000.

BONI HOMINES, hŏ'mĭ-nāz, a title borne by several monastic brotherhoods, the most noted of which is the Order of Grammont or Grammontensians, the Sack Brethren and the Canons Regular of San Giorgio. A later addition to the Boni Homines was the Order of San Salvador. In Portugal there were 14 houses of the order and missions were maintained in India and Ethiopia. Still later the Minims also joined the order. The title is an old one of Latin origin which was perpetuated in various ways in Italy. The 12 men selected to restore order in Florence in the 13th century after the withdrawal of the Ghibellines were called «buoni uomini,» and a like title was given to the overseers of the 13 city districts of Rome in the following century; while the Grammontensians were called «bons hommes» at Vincennes and probably in other parts of the country.

BONIFACE, Saint, the apostle of Germany, who first preached Christianity: b. Crediton, England, 680; d. Dokkum, West Friesland, 5 June 755. His original name was Winfrid. In the cloister school at what is now Exeter he received his first lessons in secular and religious training, and at the age of 18 he entered the Benedictine monastery in Southhamptonshire and shortly after received the habit of Saint Benedict. In his 30th year he was consecrated a priest. A great part of Europe at this period was inhabited by heathen peoples, and several missionaries set out from England and Ireland to convert them. Among these was Boniface, who in 718 went to Rome, where Gregory II authorized him to preach the gospel to the nations of Germany. He commenced his labors at Thuringia and Bavaria, passed three years in Friesland and journeyed through Hesse in Saxony, baptizing everywhere and converting the pagan temples to Christian churches. In 723 he was invited to Rome, made a bishop by Gregory II and recommended to Charles Martel and all princes and bishops. His name Winfrid he changed to Boniface. He destroyed the oak sacred to Thor, near Geismar, in Hesse; founded churches and monasteries; invited from England priests, monks and nuns, and sent them to Saxony, Friesland and Bavaria. In 732 Gregory III made him archbishop and primate of all Germany and authorized him to establish bishoprics, the only existing bishopric being the one at Posen. He founded those of Freising, Ratisbon, Erfurt, Baraburg (transferred afterward to Paderborn), Würzburg and Eichstadt. In 739 he restored the episcopal see of Saint Rupert at Salzburg. After the death of Charles Martel he consecrated Pepin the Short, King of the Franks, in Soissons, by whom he was named archbishop of Mainz. He held eight ecclesiastical councils in Germany, founded the famous abbey of Fulda and undertook, in 754, new journeys for the conversion of the infidels. In Fulda a copy of the gospels, in his own handwriting, is to be seen, and there is a statue to him also. At the place where Boniface built, in 724, the first Christian church in North Germany, near the village of Altenburg, in the Thuringian forest, a monument has been erected to his memory. The most complete collection of the letters of Boniface was published at Manz 1789, folio; and of his entire works, 2 volumes, Oxford 1845. Consult ‘Lives’ by Pahler (1879), Werner (1875), Ebrard (1882).

BONIFACE, the name of several Popes. Boniface I, elected 418 by a party of the clergy and confirmed by the Emperor Honorius, who declared the anti-Pope Eulalius a usurper. Boniface condemned Pelagianism and extended his authority by prudent measures. In a contest with the Emperor Theodosius, who endeavored to take from the bishops of Thessalonica their canonical jurisdiction over Illyria, he successfully vindicated the primacy of the Roman see. He died in 422. Boniface II, elected 530; d. 532. The death of his rival, the anti-Pope Dioscorus, a few days after his election, left him in quiet possession of the papal chair. During his pontificate Saint Benedict laid the foundations of monasticism in the west. Boniface III, chosen 607, died nine months after his election. Boniface IV reigned 608–15. He consecrated the Pantheon to the Virgin and all the saints. Boniface V, a Neapolitan, was Pope 619–25. He confirmed the inviolability of the asylums and endeavored to diffuse Christianity among the English. Boniface VI, a Roman, elected 896, died a fortnight after. Boniface VII, anti-Pope, elected 974, during the lifetime of Benedict VI, whose death he was suspected of having caused. Expelled from Rome, he returned on the death of Benedict VII and found the chair occupied by John XIV, whom he deposed and threw into prison, where he died. Boniface died 11 months after his return. Boniface VIII, Benedict Gaetano: b. Anagni of an ancient Catalonian family; elected Pope 24 Dec. 1294. He studied jurisprudence, was a canon at Paris and Lyons, advocate of the consistory and prothonotary of the Pope at Rome. After Martin IV had elevated him to the dignity of a cardinal (1281) he went as legate to Sicily and Portugal, and was entrusted with the charge of reconciling the King of Sicily with Alphonso of Aragon and Philip the Fair with Edward I of England. After Cœlestine V had resigned the papal dignity at Naples, in 1294, at the instigation of Boniface, the latter was chosen Pope. He met with opposition from the cardinals of the family Colonna, whose antagonism followed him throughout his entire pontificate. His induction was magnificent. The Kings of Hungary and Sicily held his bridle on his way to the Lateran and served him at table with their crowns on their heads. Boniface, however, was not successful in his first efforts for the increase of his power. He first opposed Albert of Austria in his contest for the imperial title, but finally yielded and crowned him emperor. He was equally unsuccessful in his attempt to arbitrate between England and France. The bulls which he issued at this time against King Philip the Fair of France obtained no consideration. This was also the case with the interdict which he pronounced against him at the Council of Rome in 1302. Intimidating the clergy in France, Philip refused to yield to the Pope's decrees. The Pope was accused of duplicity, of simony, of usurpation, of heresy, of unchastity, and it was resolved to condemn and depose him at a general council at Lyons. Philip went still further; he sent Nogaret to Italy in order to seize his person and bring him to Lyons. Nogaret united himself for this purpose with Sciarra Colonna, who with his whole family was bitterly inimical to Boniface. Boniface fled to Anagni, where Nogaret and Colonna surprised him. Boniface acted with spirit. «Since I am betrayed,» said he, «as Jesus Christ was betrayed, I will die at least as a Pope.» He assumed the pontifical robes and the tiara, took the keys and the cross in his hand and seated himself in the papal chair. But the insignia of his holy office did not save him from seizure. Colonna even went so far as to use personal violence. Boniface remained in imprisonment for two days, when the Anagnese took up arms and delivered him. After this he departed to Rome, where he died, a month later, in 1303. Boniface IX, Pietro Tomacelli of Naples, succeeded Urban VI at Rome (1389) during the schism in the Church, while Clement VII resided in Avignon. He was distinguished for the beauty of his person and the elegance of his manners rather than for a profound knowledge of theology and canon law. Even the counsel of his experienced cardinals could not save him from the commission of gross blunders. He made the annates a regular tax in 1392. Many abuses in the sale of benefices were indulged during his pontificate. A notable event in his reign was the suppression of the rebellion in Rome in favor of a republic. He supported the pretensions of Ladislaus to the throne of Naples and during the greatest part of his pontificate was engaged in negotiations at Avignon with his rivals, Clement VII and Benedict XIII. He died 1404.

BONIFACIO, Strait of, the Fretum Gallicum of the Romans, lies between Corsica and Sardinia, and at the narrowest part is only seven miles wide. The navigation is difficult owing to the rapid current and the great number of rocks, which, however, are favorable to the production of coral.

BONIFAZIO, bō-nẹ-fä'tsẹ-o, the name of three 16th-century Italian painters. Two were brothers and the third was presumably the son of one of them. Nothing is known of their early history nor even their baptismal names. The surname of «Bembo,» formerly applied to the elder Bonifazio, belonged to a painter of a much earlier period and a different school. The real family name was di Pitati. For convenience they are here numbered I, II and III.

Bonifazio I, the «Veronese»; according to Vasari, B. «*Veneziano*»: b. Verona(?) about 1490; d. 1540. He settled early in Venice and studied under Palma Vecchio, whose most brilliant pupil he became, for his works were frequently confounded with those of his master and even those of Titian, Giorgione and Paris Bordone. It is only during recent years that this remarkable painter has, so to speak, «come into his own.» While his work is essentially Venetian in color and feeling, his lively imagination and the gracefulness of his figures proclaim his Veronese origin. His most important production is the well-known ‘Dives and Lazarus’ and reveals a rare poetic imagination. Despite repainting and restoration this picture (in the Venice Academy) still retains much of its original gorgeous coloring. His ‘Judgment of Solomon’ is a wonderful study in expression of the faces of the two mothers; the ‘Massacre of the Innocents’ shows dramatic power, and an ‘Adoration of the Magi’ exhibits a splendor of color and a fine landscape. Several of his canvases are in the Royal Palace at Venice, and the Brera (Milan) contains his famous ‘Finding of Moses,’ which had long been credited to Giorgione. An unfinished work representing the ‘Visit of the Queen of Sheba to Solomon’ shows that in technical treatment he followed Giorgione by preparing his subject in tempera and completing it with transparent oil-glazes. Consult James, R. N., ‘Painters and Their Works’ (London); Layard, A. H., ‘Italian School of Painting’ (6th ed., London 1907); MacFall, H., ‘History of Art’ (London 1909–); Vasari, ‘Lives of the Painters.’

Bonifazio II, younger brother of the preceding: b. Verona(?); d. Venice 1553. He probably also studied under Palma Vecchio and certainly imitated his brother's style, so that pictures by him often pass for those of the former. It is believed that he assisted in painting the ‘Finding of Moses,’ on the ground that in parts the touch of a less skilful hand may be detected. Though he never acquired the technical skill of his famous brother in refinement, expression or richness of color, he nevertheless produced two large works which for years were attributed to Titian — the ‘Triumph of Science’ and the ‘Triumph of Religion,’ in the public gallery, Weimar.

Bonifazio III, «Veneziano»: b. Venice, between 1525 and 1530; death unknown; was living in 1579. He was probably the son of one of the two brothers of this name. As in the case of the second Bonifazio, his works not infrequently pass for those of the elder painter B., though they are easily distinguished by their less brilliant coloring and absence of that fine poetic sentiment which characterizes the first Bonifazio. «Veneziano» painted numerous groups of saints for religious institutions in 1562; these are preserved in the Venice Academy, together with a fine altar piece representing the Madonna in the clouds with saints beneath. There is also a ‘Last Supper’ in the church of Santa Maria Mater Domini.

BONIN (bō-nēn') ISLANDS, several groups of volcanic islands, numbering 20 in all and of a total area of 27 square miles, north Pacific Ocean. The northwest island of the most northern cluster, called Parry Group, is 500 miles south of the Japanese mainland. Coffin or Bailey Island is in the south, with Beechey Island between. The largest of the chain is Peel Island, on the west side of which is a good harbor called Port Lloyd. Almost every valley has a stream of water. Green turtle abound in the sandy bays. Sharks are numerous and fish of several kinds plentiful. Peel Island is inhabited by some English, Americans and Hawaiians, who cultivate maize, vegetables, tobacco and the sugar-cane. It is frequently visited by vessels in want of water and fresh provisions. The islands were discovered by the Japanese in 1593 and since 1876 have been in the possession of Japan. Pop. about 3,595.

BONINGTON, or **BONNINGTON, Richard Parkes,** English painter: b. 25 Oct. 1801, at Arnold, a village near Nottingham, where his father was a painter and lace manufacturer; d. London, 23 Sept. 1828. When Richard was in his boyhood the family removed to Calais and afterward to Paris. He early displayed a decided predilection for art, and entered as a student at the Louvre and was also for a time in the studio of Baron Gros. His genius displayed itself in landscape-painting and he rapidly rose to great eminence in this department, first in Paris and afterward in England, to whose Royal Academy exhibition he contributed several pictures which created a great sensation. He worked at first entirely in water-color, but from about 1825 he also used oil. A brilliant career was in prospect for him, when he was cut off by pulmonary consumption. Consult Muther, ‘History of Modern Painting’ (1896).

BONITO, bō-nē'tō, a fish of the mackerel family (*Scombridæ*) nearly related to the gigantic tunny but smaller, longer in body and without teeth on the vomer. There are two American species. One (*Sarda sarda*) lives in the open seas, except at spawning time, from Cape Cod to Cape Sable and occasionally in the Gulf of Mexico, where it weighs 10 to 12 pounds. In color it is dark steel blue above, with numerous dark narrow strips obliquely downward and forward from the back, and the under parts silvery. The California bonito or skipjack (*Sarda chiliensis*) is heavier and is found from San Francisco northward to Japan. In the tropics the bonito is known as the worst foe of the flying-fish. On the Rhode Island coast the fish is called abbicore.

BONITZ, bō-nĭts, **Hermann,** German classical scholar: b. Langensalza, 29 July 1814; d. Berlin, 25 July 1888. He was professor in the University of Vienna 1849–67, director of a gymnasium at Vienna from 1867 and a member of the Academy of Sciences. He was a profound student of Plato and Aristotle and was the author of ‘Uber die Kategorien des Aristoteles’ (1853); ‘Platonische Studien’ (1858–60); ‘Aristotelische Studien’ (1862–67).

BONN, Germany, a city of the Prussian province of the Rhine, formerly the residence of the Electors of Cologne, on the left bank of the Rhine, over which there is a magnificent new bridge, erected at a cost of $1,000,000, with a central span of 600 feet. It is a flourishing place and has been greatly extended and improved in recent years, though it still has many narrow, irregular streets. The town hall, completed 1782, is one of the handsomest of its edifices. Another important building is the cathedral, cruciform in plan and forming an imposing and picturesque example of the late Romanesque style of architecture. The greater part of it dates from the 13th century. But all other buildings and institutions are eclipsed by the celebrity of the university, the charter of which was given 18 Oct. 1818, at Aix-la-Chapelle by the King of Prussia, who at the same time endowed it with an annual income of about $60,000. The former residence of the Elector of Cologne was bestowed on the university and was fitted up at great expense, being surpassed in extent and beauty probably by no university building in Europe. The university possesses a library of more than 275,000 volumes, 1,235 incunabula and 1,376 manuscripts; a museum of antiquities, a collection of casts of the principal ancient statues, a collection of coins, observatory, botanic garden, etc. The paintings in the Academical Hall (among others, the great allegorical picture, the ‘Christian Church’) were executed by some pupils of Cornelius. In the front of the university is an extensive garden, with fine old avenues of trees, while from this quarter runs westward a broad, straight avenue; half a mile long, planted with horse-chestnuts, passing the observatory and leading to the botanic garden and natural history collections of the university, and to the chemical laboratory; the anatomy building, etc. In this quarter also are grounds and buildings for the use of the agricultural institute. Particular advantages are afforded for the education of young men intended for instructors. Many men distinguished in various branches of science have been connected with the university, including Arndt, A. W. Schlegel and the historian Niebuhr. The exertions of the government to collect in Bonn all the means of instruction, united with the charms of the place and the beauties of the scenery, have made the place famous. In 1901 the students numbered over 2,400. The city in recent years has become very prosperous commercially. Besides having an active trade, it manufactures machinery, earthenware, chemicals, jute, pianos and organs, porcelain wares, artificial flowers, cement and many other articles. Wessel's porcelain and stoneware factory employs 1,000 men. It dates from 1775. The means of communication are ample, both by the steamers which ply upon the Rhine and by the railways. Prince Albert studied at Bonn and Beethoven was born there, the house of his birth being now a museum. There are statues of Beethoven and Arndt, a monument commemorative of the war of 1870–71, a monumental fountain, etc. The antiquity of Bonn is considerable, and, as the residence of the Electors of Cologne, it is of historical importance. Pop. about 88,000.

BONN, University of. See Bonn.

BONNASSIEUX, bō-na-syė, **Jean,** French sculptor: b. Pannissières 1810; d. 1892. He studied in Paris and in 1836 received the Prix de Rome. He gained the favor of the French clergy by refusing to model a statue of Voltaire for the façade of the Louvre and thereafter did much work for churches. He was commissioned in 1857 to model a colossal statue of Notre Dame de France for the valley of Puy from the bronze cannon taken at Sevastopol. Other important works of his are ‘Amour se coupant les ailes’; ‘David Berger, 1814,’ and ‘Meditation,’ for which last he received the cross of the Legion of Honor.

BONNAT, bō-nạ, **Léon Joseph Florentin,** French painter: b. Bayonne, 20 June 1833. When a young man he spent several years in Spain and Italy. He studied under Madrazo at Madrid and under Léon Cogniet at Paris, first gaining recognition at the Paris Salon in 1861, when he received a second-class medal. The list of his honors is a large one, including the medal of honor at the Salon of 1869. In the Legion of Honor he was made chevalier in 1867, officer in 1874 and commander in 1882. He paints portraits and genre subjects; many of these are reminiscences of his visits to Italy and Egypt. He became a member of the Institute in 1874 and was chosen chief professor of painting in the Ecole des Beaux Arts in 1888. His work shows the influence of Velasquez and Ribera and his portraits, such as those of Thiers, Victor Hugo and Don Carlos, are remarkable for their realism. He has painted the portraits of many Americans and his portrait work is well known in this country. There are several of his works in American galleries, especially in the Metropolitan Museum, New York. Consult Claretie, ‹Peintres et sculpteurs contemporains› (1884); Van Dyke (editor), ‹Modern French Masters› (1896).

BONNE TERRE, Mo., city in Saint François County, 60 miles south of Saint Louis, in the foothills of the Ozark Mountains, on the Mississippi River and Bonne Terre Railroad. It contains a lead mine and concentration mill, railroad shops and is the headquarters of the Saint Joseph Lead Company and the Mississippi River and Bonne Terre Railroad Company. The two local banks have combined resources amounting to $80,000. The city contains a Federal building, public grammar and high schools and a Catholic parochial school. The city was settled in the sixties. It has adopted the commission form of government. Pop. 4,080.

BONNECHOSE, bŏn-shōz, **François Paul Emile Boisnormand de,** French poet and historian: b. Leyerdorp, Holland, 1801; d. 1875. He was librarian of the palace of Saint Cloud for some years and subsequently held similar posts. His one notable poetical composition is ‹The Death of Bailly› (1833). Besides a ‹History of France,› he was author of ‹Reformers Before the 16th Century Reformation› (1844); ‹The Four Conquests of England› (1851); ‹History of England› (1859); ‹Bertrand du Guesclin› (1866).

BONNEMERE, bŏn-mãr, **Joseph Eugène,** French historian: b. Saumur, 21 Feb. 1813; d. 1893. In early life he wrote a number of plays but owes his reputation to a series of historical publications, ‹History of the Peasants› (1857); ‹Vendée, in 1793› (1866); ‹Popular History of France› (1874–79); ‹History of the Religious Wars in the Sixteenth Century› (1886), etc.

BONNER, Carey, English clergyman: b. Upton, England, 1 May 1859. General secretary Sunday School Union since 1900 and joint secretary World's Sunday School Association since 1907. He was minister of the Union Church Sale, Manchester, England, from 1884 to 1885; honorary secretary, Lancashire and Cheshire Baptist Association (1893–95); minister Portland Chapel, Southampton (1895–1900). Among his many publications are ‹The Blind Man of Bethany,› ‹A Garden in the Desert,› ‹Christ and the Children of China,› ‹A Tree of Life,› ‹Ridley Lectures,› ‹The Christ, the Church and the Child,› ‹Hymns and Translations,› ‹Part Songs,› ‹Anthems and Songs,› ‹Cantatas,› ‹Child Songs,› ‹Sunday School Hymnary.›

BONNER, Edmund, English prelate: b. about 1500; d. London, 5 Sept. 1569. For his skill in canon law he was patronized by Cardinal Wolsey, on whose death he acquired the favor of Henry VIII, who made him one of his chaplains and sent him to Rome on business connected with his divorce from Queen Catharine. In 1535 he was made archdeacon of Leicester. In 1538 he was nominated bishop of Hereford, being then Ambassador at Paris, but before his consecration he was translated to the see of London. In 1542–43 he was ambassador to the Emperor Charles V. After Edward VI's accession in 1547 he was deprived of his bishopric for non-obedience in connection with the injunctions and the ‹Book of Homilies.› He was shortly afterward restored, but still continuing to act with contumacy, he was, after a long trial, once more deprived of his see and committed to the Marshalsea (1549), from which prison, on the accession of Mary, he was released and once more restored in 1553. During this reign a most sanguinary persecution of the Protestants took place, many of whom Bonner was instrumental in bringing to the stake, though it appears he was hardly severe enough to meet the wishes of the King and Queen. When Elizabeth succeeded he went with the rest of the bishops to meet her at Highgate, but was coldly received. He remained, however, unmolested until his refusal to take the oath of supremacy, on which he was committed to the Marshalsea (1560), where he remained a prisoner for nearly 10 years, until his death. He was buried at midnight, to avoid any disturbance on the part of the populace, to whom he was extremely obnoxious.

BONNER, Geraldine, pseudonym from her novel, HARD PAN, American novelist and playwright: b. Staten Island, N. Y., 1870. Her early life was spent in Colorado mining camps. Later she went to San Francisco; in 1887 she first contributed to *The Argonaut* and became its dramatic critic and foreign correspondent. Her stories also appeared in *Harper's Weekly*, *Collier's Weekly*, *Harper's Monthly* and *Lippincott's Magazine*, and among her novels are ‹Hard Pan› (1900); ‹To-morrow's Tangle› (1902); ‹The Pioneer› (1905); ‹The Castlecourt Diamond Case› (1906); ‹The Book of Evelyn› (1913); ‹The Girl at Central› (1914); ‹The Black Eagle Mystery› (1915). She also wrote the plays ‹Sham› (with Elmer B. Harris, 1908) and ‹Sauce for the Goose› (with Harry Hutcheson Boyd, 1900).

BONNER, Robert, American publisher: b. near Londonderry, Ireland, 28 April 1824; d. New York, 6 July 1899. Coming to the United States in 1839, he learned the printer's trade on the Hartford *Courant* and gained the reputation of being the most rapid compositor in Connecticut. In 1844 he removed to New York and seven years later had saved enough money to buy the plant of the *Merchants' Ledger*, a small business periodical. Changing its name to the *New York Ledger,* he turned it into a literary publication, printing the most popular kind of stories. This, combined with sensational advertising methods and the unprecedented prices paid to famous contributors, soon gave the *Ledger* an enormous circulation. Henry Ward Beecher was paid $30,000 for his ‘Norwood’; Tennyson received $5,000 for a short poem, and Dickens the same amount for a short story. At times $25,000 a week was spent in advertising the paper. Retiring in 1887, the rest of his life was spent in indulging his taste for fast horses. It was his ambition to own the fastest trotters in existence, and whenever he purchased a record breaker the animal was immediately withdrawn from public racing. His expenditures for fast horses exceeded $600,000. Some of them and their cost were: Dexter, $35,000; Rarus, $36,000; Maud S., $40,000; Sunol, $41,000.

BONNER SPRINGS, Kan., town in Wyandotte County, 17 miles west of Kansas City, on the Union Pacific, the Chicago, Rock Island and Pacific and the Atchison, Topeka and Santa Fé railroads. It contains a flour mill, ice plant, electric plant, municipal waterworks and natural gas works. The value of its taxable property is about $1,000,000. There are three banks, a high and graded schools, churches, city hall and a Masonic and Odd Fellows hall. The government is vested in a board of aldermen. Pop. 2,030.

BONNERS FERRY, Idaho, town and county seat of Boundary County on the Great Northern, the Spokane International and the Kootenai Valley railroads, at the head of navigation on the Kootenai River, 80 miles north of Cœur d'Alene. It is the centre of the logging industry of northern Idaho and of a dairying and stock raising district. There also are several producing lead and silver mines in the neighborhood. The principal industries are those connected with lumbering and agriculture. The two local banks have combined resources aggregating $656,000, and the value of all taxable property amounts to $500,000. The town has two public schools and a high school, a county court house and five churches. The municipal expenditures for general purposes amount to $7,500 annually, exclusive of $3,000 for sewer improvements. The government is vested in a board of five trustees, elected every two years. Pop. 2,000.

BONNET, bō-nā', **Charles,** Swiss naturalist and metaphysician: b. Geneva, 13 March 1720; d. Genthod, 20 May 1793. His essay ‘On Aphides,’ in which he proved that they propagate without coition, procured him in his 20th year the place of a corresponding member of the Academy of Sciences at Paris. Soon afterward he partook in the discoveries of Trembley respecting the polypus and made interesting observations on the respiration of caterpillars and butterflies and on the structure of the tapeworm. Bonnet was a close and exact observer. He carried religious contemplations into the study of nature. In his views of the human soul many traces of materialism are to be found; for instance, the derivation of all ideas from the movements of the nerve fibres. Of his works on natural history and metaphysics there are two collections, one in nine volumes 4to, the other in 18 volumes 8vo (Neuchâtel 1779). The most celebrated are ‘Traité d'Insectologie’; ‘Recherches sur l'Usage des Feuilles dans les Plantes’; ‘Considérations sur les Corps organisés’; ‘Contemplation de la Nature’; ‘Essai analytique sur les Facultés de l'Ame’; ‘Palingénésie Philosophique,’ and ‘Essai de Psychologie.’

BONNET, Jules, French writer: b. Nîmes 1820; d. April 1892. He began life as a university professor but resigned his position on account of religious opinions and turned to law. He became editor of the official organ of the Society of Protestant History in France and secretary of the Society. He was instrumental in having published the letters of Calvin in two volumes (1854). Among his published works are ‘Vie d'Olympia Morata’ (1850–65); ‘Aonio Paleario’ (1862); ‘Récits’ (1864); ‘Nouveaux récits’ (1869); ‘Derniers récits’ (1875); ‘La famille de Curione’ (1870); and ‘Souvenirs de l'Eglise réformée de la Calmette’ (1884).

BONNET, in fortification, an elevation of the parapet at a salient angle, designed to prevent the enfilading of the adjoining front of the work, where it is situated. The bonnet accomplishes, however, only part of this object, and is subject, at least in field works, to the disadvantage, that the men destined for its defense are too much exposed to be taken in flank by the fire of the enemy, on account of the necessary elevation of the banquette, a fault which cannot occur in the works of a fortress which are well laid out. The term also denotes a covering for the head, now especially applied to one worn by females. In England the bonnet was superseded by the hat as a head-dress two or three centuries ago, but continued to be distinctive of Scotland to a later period.

BONNET-HEAD, a small shark of the genus *Reniceps,* frequenting warm seas and related to the shovel-heads.

BONNET MONKEY. See MACAQUE.

BONNET-PIECE, a Scotch coin, so called from the king's head on it being decorated with a bonnet instead of a crown. It was struck by James V, and is dated 1539. Bonnet-pieces are very rare and in high estimation among antiquaries.

BONNET-ROUGE, bō-nā-roozh, an emblem of liberty during the French Revolution, and worn as a head-dress by all who wished to show themselves sufficiently advanced in democratical principles. It is said by some to have been adopted in imitation of the Phrygian cap of the same color which was worn by those who had obtained emancipation from slavery, while others maintain that it had a much more lowly origin, and was borrowed either from the Marseillais bands that flocked to Paris, or from a few Swiss soldiers who, having been sentenced to the galleys for insubordination, obtained their liberty on the acceptance of the Constitution in 1790. Having returned in a kind of triumphal procession, wearing the red cap, which had formed part of their galley dress, the fancy of the people was struck, and the bonnet-rouge was considered indispensable to every true patriot. Even the unfortunate Louis XVI wore it when paraded through the streets, after narrowly escaping with his life from the mob which had burst into his palace. After it had ceased to be generally worn, it became the distinctive badge of the men of the Mountain. During the storms of more recent periods attempts have repeatedly been made to bring it again into fashion. These have not been successful, but the revolutionary cap rejected by France has met with a more favorable reception abroad, particularly among the newly-formed republics of America, where it is often stamped upon coins, or used as an emblem upon seals. Under the restoration of the Bourbons the soubriquet of bonnets-rouges was applied to individuals who either had figured in the Revolution or were supposed to hold revolutionary principles.

BONNEVAL, bŏn-val, **Claude Alexandre** (COUNT DE or ACHMET PASHA), French adventurer: b. Coussac 1675; d. Constantinople 1747. In the war of the Spanish Succession he obtained a regiment and distinguished himself by his valor as well as by his excesses. He was, in 1706, appointed major-general by Prince Eugene, and fought against his native country. At the Peace of Rastadt in 1714, by the interference of Prince Eugene, the process against him for high treason was withdrawn, and he was allowed to return to his estates. In 1716 he was lieutenant field-marshal of the Austrian infantry, and distinguished himself by his valor against the Turks at Peterwarden (1716). In 1718 Bonneval was made a member of the imperial council of war, but his licentiousness and indiscretion induced Prince Eugene to get rid of him by appointing him in 1723 master-general of the ordnance in the Netherlands. To revenge himself on Eugene, he sent complaints to Vienna against the governor, the Marquis de Prié; but the latter received an order to arrest Bonneval, and to imprison him in the citadel of Antwerp. Bonneval being afterward ordered to appear at Vienna and give an explanation of his conduct spent a month at The Hague before he chose to comply with the summons. He was therefore confined in the castle of Spielberg, near Brünn, and condemned to death by the imperial council of war; but the sentence was changed by the Emperor into one year's imprisonment and exile. Bonneval now went to Constantinople, where the fame of his deeds and his humanity toward the Turkish prisoners of war procured him a kind reception. He consented to change his religion, received instruction in Islam from the mufti, and received the name of Achmet, with a large salary. He was made a pasha of three tails, commanded a large army, defeated the Austrians on the Danube, and quelled an insurrection in Arabia Petræa. His exertions, as commander of the bombardiers, to improve the Turkish artillery, were opposed by the jealousy of powerful pashas, the irresolution of Mohammed V, and the dislike of the Turkish troops to all European institutions. He enjoyed, however, the pleasures of his situation. The memoirs of his life under his name are not genuine.

BONNEVILLE, bŏn-vĭl, **Benjamin L. E.,** American soldier and explorer: b. France about 1795; d. Fort Smith, Ark., 12 June 1878. He graduated from West Point 1815, became a captain of infantry 1825; and in 1831–36 engaged in an exploring expedition to the Far West, across and beyond the Rocky Mountains. His journal and other manuscripts were edited and enlarged by Washington Irving, who published them under the title of ‹Adventures of Captain Bonneville, U. S. A.› (1837). He fought with gallantry in the Mexican War, taking part in the siege of Vera Cruz, the battle of Cerro Gordo, the capture of San Antonio, battle of Churubusco, where he was wounded, the battle of Molino del Rey, the storming of Chapultepec, and the ensuing assault and capture of the city of Mexico. In 1857 he commanded the Gila expedition, and in 1861 was retired from active service, «for disability resulting from long and faithful service, and from sickness and exposure in the line of duty.» In 1865 he was brevetted brigadier-general in the regular army «for long and faithful services.» Consult Cullum, ‹Officers and Graduates of the United States Military Academy› (Vol. I, 1868).

BONNEVILLE, Lake, a lake of the Pleistocene epoch that twice filled a now desert basin of Utah. At its greatest dimensions it had an area of 20,000 square miles, and was 1,000 feet deep. Consult ‹United States Geological Survey, Monograph No. 1› (1890).

BONNEY, Charles Carroll, American lawyer: b. Hamilton, N. Y., 4 Sept. 1831; d. Chicago, Ill., 1903. In 1850 he removed to Peoria, Ill., took an active part in establishing the present educational system of that State; was admitted to the bar 1852, settled in Chicago in 1860, and acquired a large and successful practice. He was one of the originators of the law and order movement and was president of the National Law and Order League 1885–93. In 1893 he was the organizer and general president of the World's Congresses held at the Columbian Exposition; there were over 200 of them, and they proved a marked feature of the World's Fair. Besides numerous pamphlets, addresses and essays on public questions he has written ‹Rules of Law for the Carriage and Delivery of Persons and Property by Railway› (1864); ‹Summary of the Law of Marine, Fire and Life Insurance› (1865); ‹Our Remedy in the Laws› (1887); ‹The Present Conflict of Capital and Labor› (1886); ‹The Executive Power and the Enforcement of the Laws› (1890); and edited A. W. Arrington's ‹Poems› (1860).

BONNEY, Thomas George, English geologist: b. Rugeley, 27 July 1833. He was president of the Geological Society of London 1884–86 and president of the British Association 1910–11. He has written ‹Outline Sketches in the High Alps of Dauphine› (1865); ‹The Alpine Regions› (1868); ‹The Story of Our Planet› (1893); ‹Charles Lyell and Modern Geology› (1895); ‹Ice Work› (1896); ‹Volcanoes› (1898); ‹The Building of the Alps› (1912); ‹Present Relations of Science and Religion› (1913), etc.

BONNIE BLUE FLAG, a popular Confederate ballad first sung in public at the Varieties Theatre in New Orleans in 1861.

BONNIVARD, bōn-nẹ-vär, **François de,** Swiss patriot, a younger son of a family which held large possessions under the house of Savoy: b. Syssel about 1496; d. Geneva 1570. In 1513 he bacame prior of Saint Victor at Geneva, but falling under the suspicion of the Duke of Savoy, was taken prisoner by him in

1519. After 20 months' imprisonment he was set free, but in 1530 he was again seized and taken to the castle of Chillon at the east end of the Lake of Geneva, where he was imprisoned for six years, the last four in that subterranean vault which Byron has made famous by his poem on the sufferings of ‘The Prisoner of Chillon.’ He left the town his books, which were the nucleus of the Geneva library. His chief works are his ‘Chroniques de Genève’ (written in 1551, published 1831 and 1867), and ‘De l'Ancienne et Nouvelle Police de Genève’ (1555). See Gribble, ‘Lake Geneva and Its Literary Landmarks’ (1901).

BONNY, a river of Nigeria, West Africa, one of the mouths of the Niger. The town of the same name is situated on the eastern bank of the river near its mouth. It has a good harbor and does a considerable trade in palm-oil, but the climate is unsuitable for Europeans. Pop. about 9,000.

BONONCINI, bō-nŏn-chē'nẹ, or **BUONONCINI, Giovanni Battista,** Italian composer: b. Modena about 1660; d. about 1750. His proficiency on the violoncello gained him admittance into the band of the Emperor Leopold at Vienna, where, at the age of 18, in emulation of Scarlatti, he wrote an opera called ‘Camilla,’ which was favorably received. In England for several years scarcely any opera was tolerated which did not contain some of Bononcini's airs, and upon the almost simultaneous arrival of himself and Handel in London, notwithstanding the superiority of the latter, two parties, the one for Bononcini and the other for Handel, were formed, between whom an exciting contest was waged for several years. Gradually, however, Bononcini's popularity waned, and having been detected in an act of musical plagiarism, he left England in 1733, found his way to Paris and Vienna, and finally went to Venice, where all traces of him are lost.

BONONE, bō-nō'nā, **Carlo,** Italian painter: b. Ferrara 1569; d. 1632. He studied the works of the Caracci and Veronese, and shows the influence of both styles in his own work. He taught painting in Ferrara, having many prominent painters of the town under his instruction. Among his paintings are ‘The Arisen Christ’ and ‘Patriarchs and Prophets.’

BONPLAND, bôñ-plän, **Aimé** (Jacques Alexandre), French naturalist, noted as the friend of Humboldt, and the companion of his wanderings: b. Rochelle, 22 Aug. 1773; d. Corrientes, Argentina, May 1858. He studied medicine, and served for a while in the French navy as surgeon. Having returned to Paris to continue his studies, he there made the acquaintance of Humboldt, then a young man actively engaged in the pursuit of scientific knowledge at the French capital. On the latter projecting his journey to the New World, Bonpland readily agreed to accompany him, and shared in all the adventures and toils of that celebrated expedition. In the course of it he collected upward of 6,000 plants, previously unknown, and on his return to France in 1804 presented his herbarium to the Museum of Natural History, and had a pension granted him by the Emperor Napoleon. A great friendship subsisted between him and the Empress Josephine, who frequently endeavored to cultivate in her garden at Malmaison the flowers whose seeds he had brought from the tropics. On the Restoration he proceeded to South America, and became professor of natural history at Buenos Aires. He subsequently made an extensive journey across the Pampas to the foot of the Andes, and ascended the river Parana into Paraguay, but was arrested by Dr. Francia, the governor of Paraguay, as a spy, and detained a prisoner for eight years, till 1829. He afterward settled at San Borja, near Monte Video, and after 1850 lived at Corrientes.

BONSTETTEN, bŏn-stĕt'ĕn, **Karl Victor von,** Swiss publicist: b. Bern, 3 Sept. 1745; d. Geneva, 3 Feb. 1832. He studied at Leyden, Cambridge and Paris; entered the council of Bern, and became district governor, and, in 1795, a judge in Lugano. He lived in Italy and at Copenhagen from 1796 to 1801, and after his return settled at Geneva. Among his larger works are ‘Recherches sur la Nature et les Lois de l'Imagination’ (Geneva 1807); ‘Pensées Diverses’ (1815); ‘Etudes de L'Homme’ (1821), and ‘L'Homme du Midi et L'Homme du Nord’ (1824), an examination of the influence of climate. Several volumes of his correspondence have been published.

BONTEBOK, bŏn'te-bŏk, a small South American antelope (*Bubalis pygargus*) closely allied to the blessbok (q.v.), but of slightly larger size, and having the continued white blaze on the face to the root of the lyrate horns. See Hartebeest.

BONUS BILL, an act reported to the United States House of Representatives by John C. Calhoun, 23 Dec. 1816, appropriating «as a fund for constructing roads and canals» the $1,500,000 paid by the United States Bank as a bonus for its charter privileges, and all future dividends from its stock. The real object was to build the Erie Canal, which New York did not feel able to do alone. Its managers,— De Witt Clinton, Gouverneur Morris, etc.,— relying on the administration holding the same ideas which Jefferson and Gallatin had formerly voiced, formed a «log-roll» in Congress with various local interests, and carried the bill by 86 to 84 in the House, and 20 to 15 in the Senate, the opposition being scatteringly local rather than sectional, or constitutional; but Madison vetoed it on strict-construction grounds. The apparent injury was to New York: the real injury was to the South. New York went on and built the canal herself, giving her an irresistible advantage over her rivals, while the South was not rich enough to build the canals from the Chesapeake to the Ohio, enriching Maryland and Virginia, nor from the Santee to the Tennessee, enriching the Carolinas and Tennessee, and if the general government had helped the Erie it must have helped the others also.

BONVALOT, bôn-vạ-lō, **Pierre Gabriel,** French explorer: b. Epagne, Aube, 1853. He received his education at the Troyes Lycée. With Ujfalvy he went on a tour of exploration to the interior of Asia in 1880 and six years later visited Persia, Turkestan and the Pamirs, Siberia and Tonking. In 1897 the government sent him on a special mission to Antoto, Abyssinia. He has written ‘En Asie

Centrale’; ‘De Moscou en Bactriane’ (1884); ‘Du Kohistane à la mer Caspienne’ (1885); ‘Du Caucase aux Indes à travers le Pamir’ (1888); ‘De Paris au Tonkin à travers le Tibet inconnu’ (Eng. trans., 1891, under title ‘Across Thibet’); ‘L’Asie inconnue’ (1896).

BONVIN, bôn-văn, **François Saint,** French genre painter: b. Vaugirard, 22 Sept. 1817; d. Saint Germain-en-Laye, 18 Dec. 1887. He was self-taught, exhibited often at the Paris Salon and received the medal of the Legion of Honor in 1870. For a long period his work was not popular, but his paintings are now much prized by collectors on account of their rich coloring and sober tone. Among them are ‘Charity’ (1852); ‘Regimental School’ (1853); ‘Corner in a Church’ (1880).

BONWICK, James, Australian author and historian: b. London 1817; d. 1906. He went to Tasmania in 1841. He traveled extensively in almost every habitable part of Australia; and lived many years in Victoria. He so identified himself with the life of the country that he came to be looked upon as an Australian. He has to his credit a long list of books relating to the early history of Australia.

BONY-FISH. See MENHADEN; TEN-POUNDER.

BONY, or GAR PIKE. See GAR.

BONZANO, bon-zä-nō, **Giovanni,** Italian Roman Catholic prelate: b. Vigevano, Italy, 1867. He was educated at the Seminario di Vigevano and at the Propaganda College, Rome. He was ordained to the priesthood in 1890 and from 1891 to 1897 was engaged in the China missions. In 1899 he was made vicar-general of the diocese of Vigevano and in 1901 professor of theology at the seminary there. In 1904 he became rector of the Urban College of Propaganda, Rome, remaining in this relation until 1 Feb. 1912, when he was named by Pius X apostolic delegate to the United States in succession to the late Cardinal Falconio. He was made domestic prelate to his Holiness in 1904 and on 3 March 1912 was consecrated titular archbishop of Mitilene.

BOOBY, a name given long ago by British sailors to several of the smaller tropical species of gannet (q.v.), because of their «stupidity,» which consisted simply in their fearlessness when visited upon their island breeding places. Having had no acquaintance with man they had no reason to fear him. Most of the species are widespread, and, in their haunts, abundant. One species (*Sula variegata*) is, however, confined to the coasts of Peru, where it contributes largely to the valuable guano deposits on the islands there.

BOOK. Used without qualification, the term currently implies a printed literary composition in many sheets; but in law and custom it has received three extensions, one of form and two of matter. The form includes anything bound like a book — volumes of accounts, or of blank leaves for keeping them or for indexing, etc., and even «books» of gold-leaf, 25 thin strips in a cover. The matter includes — by English statute law, «every volume, part or division of a volume, pamphlet, sheet of letterpress, sheet of music, map, chart, or plan separately published»; in literary usage, the written compositions of ancient times on whatever material, if of some volume.

Historically, it is curious that primitive attention has invariably seized first on, and named the writing after, neither form nor matter, nor even the method of writing, but the material on which the writing was executed; every name in common use, present or past, refers to this. «Book,» A.-S. *bōc,* is from an old Teutonic *boks,* that is, «the beeches,» tablets of beech-bark on which runes were cut or painted; Latin *liber,* whence French *livre* and our «library,» was the same thing, the inner bark of a tree, and the name was later given to the papyrus tissue from its bark-like appearance; *codex* or *caudex,* our «code,» and still used in its Latin form for old texts, meant the trunk of a tree, then wooden tablets, then square volumes like wooden blocks instead of those in scrolls; the Greek *byblos,* our «Bible,» was another name for the papyrus; and modern usage clings to the same connection of ideas — we speak of reading «a paper» before an audience. On the other hand, the words «write,» «inscribe,» and «scripture,» and the various «-graphs,» all from words meaning to cut, commemorate a time when all writing was by scoring lines on some hard substance. Of course special terms refer to various aspects of the book: «volume» (Latin *volumen,* from *volvo,* to roll) was the wooden roller around which a convenient section of a long composition was twisted; «tome» means a cutting — of the book into parts, exactly the same as «section.»

It is difficult to say at just what point the ancient writings may properly be called «books.» It is evident that mere scorings or paintings of short compositions on a single surface — runes, hymns, poems, epistles, proclamations, business documents or what not — cannot be called books, even if the surface is large; though Lord Macaulay facetiously speaks of a rising young Assyrian architect who «published a bridge and four walls in honor of the reigning emperor.» On the other hand, long compositions carried over many tablets, grouped in numbered or lettered pages and divided into «volumes» or shelves, and even sometimes with the owner's book-plate (q.v.) attached, cannot be denied the name; nor can extensive compositions on papyrus like the ‘Book of the Dead,’ dating back well toward 2,000 B.C. if not earlier, nor the famous ‘Papyrus Prisse,’ the oldest volume known to exist. The Babylonian and Assyrian books were drawn on clay tablets or polygonal cylinders (afterward hardened) with an iron stylus, producing the wedge-shaped or «cuneiform» characters, some of them so small and skilfully executed that they suggest the use of a magnifying glass — quite likely a ball of crystal. These about the 7th century B.C. had begun to be gathered into royal or temple libraries, to the inestimable service of modern historical research; the vast majority of our knowledge of old Babylonia and Assyria comes from two great libraries, that of Ashurbanipal (Sardanapalus: 668–626 B.C.) at Nineveh, and that of the Temple of Bel at Nippur. Yet, oddly, while our civilization as a whole is a direct heir of the Babylonian, and its details owe to that, through the Greek and Latin, a score of items to one of the Egyptian, our books have no connection with the Babylonian and are the immediate progeny of the Egyptian; an unbroken sequence can be maintained from the volume in the reader's hand to the 'Papyrus Prisse,' perhaps more than 2,000 years before Christ, and containing the still older composition, regarded as the oldest extant book in the world, the 'Maxims of Ptah-Hotep,' dating probably from 2500 B.C.

Owing to the cheap and easy preparation of the papyrus tissue, by pulping the pith and spreading it out to dry, essentially like our paper, and its wonderful adaptability to literary use beyond anything discovered for many ages,— its thinness and lightness, yet hard, smooth, glossy surface showing off inks and pigments so beautifully — its use spread to Greece before the time of Herodotus at least, and to Rome, and maintained its position as a book material down to the 10th century A.D. Ali ibn el Azhad in 920 describes the different kinds of pens required for writing on paper, parchment and papyrus (see Karabacek's 'Das arabische Papier,' 1887). Unhappily, however, it had one insuperable defect for laws, records or whatever else needed perpetuity: it was very sensitive to dampness, and dissolved and crumbled away in a few generations. Hence it is not merely probable but certain that the great mass of classical literature is lost forever, disintegrated and gone with its material record. The only place where any considerable finds are still possible is Egypt, whose dry climate can preserve such things for countless ages, and whose libraries had vast quantities of the best Greek and Roman works: some remarkable discoveries have already been made there, and more may be hoped for. But for this reason, papyrus was largely supplanted for public uses, and with the wealthier collectors or authors, or for very popular books, by parchment, fine dressed skin, the material used by the Jews, Persians and other Oriental nations. When the book had outlived its popularity or a more exigent use was found for the parchment, which was costly, the former writing was rubbed off or in, and a new book copied on, and this process was repeated sometimes six or seven times. Thanks to the fact that the erasure always left the outline of the old characters possible to revive by certain chemicals, and that for clearness the new book was written crosswise to the old, so that the imperfectly erased words should not show up through and cause confusion, these *palimpsests* have yielded us many treasures supposed to have been extinguished.

As the very name «book» shows, however, paper-pulp and skin and clay were not the only materials used for books by the ancients; in fact, it would be hard to cite any common smooth-surfaced article not so used. Animal, vegetable and mineral substances have all been drawn on; metals, wood, wax, ivory, leaves, bark, etc. Wooden books were common among both Greeks and Romans; part of one containing Solon's laws was preserved at Athens till the 1st century. For the more important purposes, laws and edicts, they employed (before the general accession of parchment) ivory, bronze, etc.; Hannibal engraved an account of his campaigns on bronze plates, which if they could be supposed existent, would be worth excavating all South Italy for, especially as the writing must have been in Carthaginian. The antiquary Montfaucon in 1699 bought at Rome a book of six thin leaden leaves, about 3x4 inches, with covers and hinges of lead; it contained Egyptian hieroglyphics, etc. For the common needs of business and social life, however,— contracts and wills, etc.,— the Romans used *diptycha* and *tabulæ* or *pugillaria* — sheets covered with wax, to be written on with a stylus, and protected from contact by a raised margin, or opposite projections in the centres. Two of these, of date 169 A.D., were discovered early in the 19th century in Transylvania, and one of 1301 is preserved in the Florentine Museum. In the University of Göttingen is a Bible of palm-leaves, containing 5,376 leaves. Among the Kalmuck Tartars was found a collection of books made of long narrow leaves of varnished bark, the ink black on a white ground.

The shape of wooden and metal books, waxen and ivory tablets, and those of other hard substances, was square; but the thin flexible papyrus was too liable to dog's-ear and tear from handling in such form, and a method was adopted which has left deep traces on our book terminology — of rolling the sheets on wooden cylinders, very much in the fashion of a modern mounted map. They were written on one side only, fastened together at the edges, and glued or otherwise attached to the roller, which was called in Egyptian a *tama,* in Greek a *kulindros* (cylinder), in Latin a *volumen* (roller), our «volume.» We still speak of a piece of writing poetically as a «scroll.» Some of these were of huge size: specimens of Egyptian book-rolls still exist extending to 20 and even 40 yards (see Birt's 'Das Antike Buchwesen,' p. 439); but the great inconvenience of consulting such enormous sheets, and the injury to themselves in the process, caused the breaking up of lengthy literary productions into sections, each on a separate roll. Certain handy sizes became normal, like the ordinary novel or essay volume of to-day; and this conventional length of roll exercised great influence on the length of what are still called the «books»— that is, chapters — of the classical authors, one of these being about enough to make a roll or volume of. At each end of the roller was the *umbilicus* (navel) or *cornus* (knob), a boss to turn it by, and the volume was read by unrolling the scroll to expose successively the sheets or *paginæ* (things «fastened» together). The title was generally written in red, on fine vellum, and pasted on the outside, which was dyed with cedrus or saffron. Much labor and expense was often involved in the ornamentation of books, and pleasant conceits were sometimes conveyed by their color. The practice of perfuming the pages to which Martial alludes, «when the page smells of cedar and mantles with royal purple,» was not abandoned till very modern times. Lord Burghley, instructing the vice-chancellor of Cambridge concerning the proper presentation of some volumes to Queen Elizabeth, cautions him to «regard that the book had no savor of spike» (spikenard), «which commonly bookbinders did seek to add to make their books savor well.» It seems an odd lure to book-buyers; but in this age we can hardly realize the important part played by perfumes in ages when pretty much everything and everybody smelt ill, when filth and the lack of washing or changing of clothes assailed all noses with evil stenches, and an agreeable scent was one of the greatest and rarest luxuries of life. In Egypt the rolls were kept in jars holding nine or ten each; in Rome they were kept in wooden boxes or canisters, often of costly workmanship, or in parchment cases. The change from scrolls to *codices,* or square books, seems to have taken place generally in the ancient world after the adoption of parchment or vellum; they appear to have been coming into general use in Martial's time (last half of the 1st century A.D.), as he alludes to their advantages. The name *codex* is still used for the more important ancient MSS., as the «Codex Alexandrinus.» Not all the parchments were folded or arranged in small square sheets as now, however: M. Santander owned a beautiful Hebrew Pentateuch written on 57 skins of Oriental leather, sewed together with threads or strips of the same material; it formed a roll of 113 French feet (120.45 English) long. And practically the same arrangement of successive surfaces had been enforced in the use of the clay or wooden tablets, from the nature of the articles. The form remained substantially unaltered throughout the Middle Ages, and being even more suitable for paper than for vellum, was ready on the invention of printing to facilitate its full development; though important differences in bulk, arising as well from the condition of the art and its materials as the fashion of the times, distinguish books of the earlier periods of printing from those of to-day.

Production and Prices.— It is assumed that until the invention of printing, books were of excessive rarity and costliness. This is mostly true of the Middle Ages, when the only trained chirographers were in the monasteries — working at free will and leisure and caring solely for quality, and with the express object of making the books costly. It was not so, however, in classic times, owing to that society being based on skilled slave labor. From this cause, the greatest extremes of price prevailed side by side, extreme cheapness and almost incredible dearness. When but few copies of a book were made, either by an author of slender means or by a wealthy amateur to give to friends, they were either given away, or if sold might command any price an unexpected favor of a rich man's fancy dictated; and from the same cause «unique copies»— most likely such were the three books of Philolaus the Pythagorean, for which the not rich Plato paid about $1,600, and the few books of the philosopher Speusippus for which Aristotle paid three Attic talents or some $3,500 — were much commoner than now. On the other hand, Anaxagoras' works could be had for a drachma (about 18 cents) even when dear — a thing the more strange that two pieces of papyrus for copying an account cost in 407 B.C. 2 drachmæ 4 oboli, or about 45 cents. Perhaps there was a difference in the paper. In this same year a *diptychon,* or pair of wooden account tablets (passbook), cost a drachma; but in Demosthenes' time, three quarters of a century later, one (probably smaller) cost only two *chalci* («coppers»), less than a cent. All these contradictions are probably due to the lack of any regular publishing market.

The long agonies of dissolution of the Roman empire annihilated the book trade; and for centuries the only makers of books were the monk scribes, in whom the important conditions of skill, leisure, love and patience were all fulfilled. Learning had become the exclusive privilege of a class, a privilege of which they were at once proud and jealous; and they surrounded the means of its acquisition with a pomp and circumstance that precluded the multitude from familiarity with it. In the earliest times books had received the adorning aid of ornamental art; but in the Middle Ages they reached the acme, if not of beauty and convenience, at least of cost. The favored works of the time, principally of the Christian writers, were laboriously transcribed by patient penmen, in *scriptoria* liberally maintained in the monasteries, and specially devoted to that purpose. In the process of preparation their books received the most careful attention in regard to accuracy, elegance and solidity. In the monasteries also the work was completed; for not only were the monks transcribers, illuminators and binders, but the same individual frequently combined the triple function in his own person. From the hands of the scribe, whose solemn adjuration at the conclusion of his task was evidence not only of his own care but of his desire that others should imitate his example, the book passed to the illuminator, whose gorgeous colors still delight the bibliophile; and from him to the binder, by whom its ponderous proportions were encased in massive covers of wood and leather, studded with knobs and bands, often of gold and silver, and closed with broad clasps — to unfasten which, letting the covers swing open on their stout hinges, was a privilege to which not every one was permitted to aspire. For, as said Richard De Bury, «laymen, to whom it matters not whether they look at a book turned wrong side upward or spread before them in its natural order, are altogether unworthy of any communion with books.» Precious metals and the less crude but equally costly productions of art contributed to swell their value, in respect of which they stood at times on an equality with houses and lands. When publicly exposed, they were frequently secured by chains; they were protected by special statutes; were subjects of grave negotiation; solemnly bequeathed by will, and lent only to the higher orders, who were compelled to deposit ample pledges for their return. Even so late as 1471, Louis XI was compelled by the faculty of medicine at Paris to deposit a valuable security, and give a responsible endorser, in order to obtain the loan of the works of Rhasis, an Arabian physician. Instances of the immense prices of special books are familiar, as of King Alfred's giving eight hides (perhaps 500 acres) of land for one book, but England was well-nigh bookless then; of the Countess of Anjou giving 200 sheep and other articles for a book of homilies of a bishop — an enthusiastic lady might do so if she liked the bishop; and of other fancy prices for very fine books, not however more than modern collectors might for superb copies. The form in these cases often counted for more than the matter, just as now. On the other hand, in 1431, shortly before the invention of printing, Peter Lombard's works sold at Caen for seven francs, or $1.30, probably equal to about $10 now; but he was the most popular and widely circulated author in the Christian world before Thomas à Kempis, and it was to the interest of the Church to multiply his works. Making all allowances, books were very scarce and costly.

Arrangement of a Book.— The first page or *recto* of the first leaf or «folio» is technically known as a bastard or half-title page; the next page or *verso* of the first folio is left blank. (The term «folio,» however, as usually employed by printers, means simply page number). Then follows the title-page proper, usually with a blank page at the back. In many books there intervene a preface or introduction, a dedication and a table of contents, before the main body of the book begins; the table of contents is sometimes before and sometimes after the introduction and preface. If any portion of the book is out of place, there are two ways by which the true order may be discovered. At the outer corner, or in the centre above the reading matter, or in pages with a chapter heading usually in the centre at the bottom of the page, is a numeral either Arabic or Roman — 1, 2, 3, or i, ii, iii; the almost universal custom now is to use the Roman numerals for prefaces and introductions, and the Arabic for the body of the text, and in catalogues these are indicated thus: pp. xxxvii, 325 — that is, 37 pages introduction paged with Roman letters, and 325 of text paged with Arabic. As a guide to the binders in gathering the sheets, also each «form» as printed on the press — the number of pages printed on one sheet, to be folded and cut later into the proper order of reading — has at the bottom of its first page a number or letter in sequence through the book; that is, if each sheet as printed has eight pages on it, then pages 1, 9, 17, etc.,— the *outside* sheet of each form, which lies on top and visible when the sheet is folded,— will have the numbers 1, 2, 3, etc., or the letters A, B, C, etc., called «signatures,» to show the binder in what order the folded sheets are to be assembled. If the forms outnumber the letters of the alphabet when these are used, the signature series continues either as AA or 2A, etc. When two sections of a book begin printing simultaneously for expedition, and as it is uncertain where the first will end, the second has its page folios begun by guesswork — if the first runs over it is necessary to duplicate a certain number of the closing pages of the first section, as 480A, 481A, etc., or else to continue the closing number, as 496A, 496B, etc., or if only one or two, 496½, 496¾.

Sizes of Books.— The copyists made up their paper or vellum books by folding four, five or six sheets and placing one within the other, making quires or gatherings of 8, 10 or 12 leaves, known respectively as quaternions, quinterns or quinternions, and sexterns, or in Greek tetradia, pentadia and hexadia. The first printers adopted the same method, printing one page at a time and only on one side of the sheet; the register or collation of the quires for guide to the binder was given in the colophon (q.v. below), and only later supplanted by a signature on each quire, at first inserted by hand, and first printed at Cologne in 1472. When more than one page was printed at once, the number of times the paper had to be folded was a fair guide to the dimensions of the page, at a time when (and for ages later) the paper was made by hand, on frames whose size was held closely alike by the exigencies of human arms; and folio, quarto, octavo, duodecimo, etc., expressed not only the absolute fact of folding, but the constructive fact of size. These names were conveniently abbreviated, except the first, to 4to, 8vo, 12mo; and when improved machinery and larger sheets of paper enabled still more sheets to be printed at once, the Latin names to correspond were not used at all, the terms 16mo, 24mo, 32mo, being employed at once. All these names still survive, though — with the advent of great paper-mills and machinery which make any size desired for an edition, so long as it is an «engine run,» the actual printing on large editions of 64 pages at a time, and minute calculations which figure to an eighth of an inch margin — they have ceased to express any fact worth knowing; and in the United States it is now more usual to give on catalogues the height and breadth of pages. But in Europe the old fashion still prevails. So far as the names now mean anything, a 12mo indicates the usual size of a popular volume or essay volume, and an octavo the stately and dignified memoir or volume of travel or «complete works» or cyclopædia; but in fact even these are rarely printed in less than 16s. A sheet folded in the middle forms two leaves or four pages; and a book composed of such sheets is styled a folio, whether it measure a foot and a half or four feet high. When the sheet is again folded it makes a quarto. In hand-made paper (that used in nearly all the small special editions and those of bibliographical interest) the water line runs either across or down the page, according to the number of foldings. The following scheme is serviceable: Folio, folded once, 4 pages, water line perpendicular; quarto, twice, horizontal; octavo, four times, perpendicular; duodecimo, six times, horizontal; 16mo, horizontal; 18mo, perpendicular; 32mo, perpendicular; 36mo, 48mo, 64mo, horizontal; 72mo, 96mo, perpendicular. In Great Britain for a long period printing paper was chiefly of three sizes — royal, demy and crown; and the book was large or small according to which was used. Demy was the commonest, and the demy octavo was the established form of standard editions. Among books as among men there are giants and dwarfs. The British Museum has the largest and the smallest in the world. The former is an atlas seven feet high, of the 15th century, completely concealing a tall man between the pages, with a binding and clasp which make it look as solid as the walls of a room; the latter is a tiny «bijou» almanac less than an inch square, bound in red morocco, easily to be carried in the finger of a lady's glove.

Certain church books in the Escurial are described as six by four feet; and the «Antiquity» volumes of the Napoleonic ‹Description de l'Egypte› are 37½ inches high. The Thumb Bible or Toy Bible, on the other hand, was one by one and a half inches; it was not really a Bible, but an abstract, printed in 1693 and dedicated to the Duke of Gloucester, and repeatedly reprinted. Hoepli's ‹Divina Commedia› (1878) is less than 2¼ by 2½ inches; and Pickering's diamond edition of Tasso measures 3½ inches high by 1⅞ wide.

Colophons.— These originated with the Assyrian scribes in the 7th century B.C. at latest: Ashurbanipal's in the Nineveh library put at the end of the last column of their cylinders a register of the documents composing the «book.» The early printers followed the same style, using the last paragraph of the last page — now called by English bookmen the colophon (Greek, apex or terminus), by French the *souscription,* by Germans the *schluss Schrift* — to give details about the book, which we should now assign to the titlepage, or merely for a sort of *envoi* or «send-off.» The usual terminus of books was «Explicit,» «Hic Finis,» «Finis,» «Here Endeth,» or something of the sort; but some printers expanded it into elaborate epilogues or postfaces. Caxton is notable for this; see examples in Blade's ‹Caxton,› and for others see Legrand's ‹Bibliographie Hellénique› (1885). With development of the titlepage, the colophon disappeared, though instances are found well into the 16th century.

Title Pages.— It is curious that while the early development of printing ran to enormous and elaborate titlepages, Caxton has none at all, except one to a work not certainly his, ‹The Chastising of God's Children› (?1491); and even that contains only three lines of ordinary print. But in Venice as early as 1474 a ‹Calendario› by John de Monteregio was issued by Pictor, Loslein and Ratdolt, with a quaint rhyming titlepage, with place, date and names at the foot. A facsimile is given in Bouchot's ‹The Printed Book.› The treatment of the titlepage has varied enormously with different periods. In the 16th and 17th centuries it was at its worst; the object apparently being to make it a digest of the entire contents of the book (Nares' ‹Life of Burleigh,› of which Macaulay says that «the title is as long as an ordinary preface,» is a mild example in the 19th), and half destroying the very object of the title by making it difficult to wade through and come at the real theme. Frequently it gave a laudatory description of the book, a plan which if adopted to-day would save the reviewers the trouble of reading the preface: «A Book Right Rare and Strange,» «Very Necessary to be Known,» «Very Pleasant and Beneficial,» etc., are familiar to the student of early printing. Modern titles are thought to violate both good taste and good business judgment in going beyond a short plain sentence or name; but they sometimes do worse by misleading the cataloguer, as when Ruskin's ‹Notes on the Construction of Sheepfolds› is classed among works on live stock. Double titles, as where a sub-title is given of a seemingly different purport from the main one, are also perilous. As to the frequent practice of reissuing an old book under a new title, it is pure fraud, wasting the money of libraries and private buyers on what they have already or do not want, throwing catalogues out, and making confusion all around. The punishment of using a title already appropriated, even unknowingly, is direct and by law, for the title of a book is protected by law as much as any other part of the contents. For the lore and facsimiles of titlepages, see Andrew Lang's «Old French Title-Pages» in ‹Books and Bookmen›; Le Petit's ‹Principales Editions originales d'Ecrivains français› (1888); and Könnecke's ‹Bilderatlas› (1887).

Dating of Books.— One of the most exasperating traits of the early printers, like the monkish scribes, was its rarely occurring to them to put dates to their books. Only five out of 21 of the known works of Colard Mansion, Caxton's master, are dated, and more than two-thirds of Caxton's own are dateless. On the other hand, in the colophon to the ‹Moral Proverbs› and in the ‹Book of the Knight of the Tower,› the dates are set down with excessive minuteness, even to the month and day. Modern publishers only fail to date a work when it is out of date and the fact is to be concealed from the buyer; a common deception of the trade is to reissue an old work with a new titlepage and usually a new copyright date, sometimes shifting the introductory matter so as to change the pagination or «folioing.» The usual and now universal date is either by Roman numerals (an antiquated annoyance it would be better to abolish), or by Arabic numerals, which for some inscrutable reason are held a trifle underbred. In the earlier books some queer freaks are indulged in. One is to put Roman lower-case numerals before some of the capitals as multipliers; unfortunately, others use exactly the same as signs of subtraction, and others still use capital letters as subtractors, so that the reader's guess needs confirming from outside. For example:

M CCCC iiijXX VIII (1488: 1000 + 400 + 4 × 20 + 8).
M iiiiC iiiiXX Viij (1488: 1000 + 4 × 100 + 4 × 20 + 8).
M iiijD (1496: 1000 + 500 — 4).
M IIID (1497: 1500 — 3).

Sometimes the early printer used odd chronograms or titles in which a date is expressed by the numeral value of the letters contained in or marked in it; in some cases repeating in this a date already given on the titlepage. For instance, ‹De spIrItaLI IMItatIone ChrIstI saCræ et VtILes pIIs In LVCeM Datæ a R. P. Antonio Van den Stock Societatis Jesu, Ruræmundæ, Apud Gasparem du Pres› — a book with two chronograms on 1658 in the title, but a superfluity in the centre, and containing in the text over 1,500 on the same date. Two modern volumes of chronograms are Hilson's (1882 and 1885).

The date is often determined approximately by the water-marks on the paper; but this is one of the most persistently forged of all things and demands the greatest knowledge and judgment.

Place of Publication.— This is not always instantly apparent even when printed, as the various local forms and their varied Latinizations or the use of obsolete terms often make a bewildering complexity for a single place; or a punning or pseudo-classical translation may be used, not a true ancient form; or the same Latin or Greek form may mean one of two or three places; or it may be used expressly to throw the inquirer off the track. The latter is of course undiscoverable except by outside evidence, which however in forthcoming in a surprising number of cases. The motive may be anything from sincere religious or patriotic zeal to the most bestial criminality; most «shady» modern literature has either no assigned place of publication or a false one, and some are «published» an immense distance from where they are printed — a common enough thing in legitimate publication in modern times, though practically unknown in early ones, printer and publisher being the same. Hundreds of European books are nominally published at Pekin, or Tokio, or Calcutta; the unsavory products of Parisian presses are usually fathered on some Dutch or Belgian city; and Sir Richard Burton's unexpurgated ‹Arabian Nights› was accredited to Benares, India.

The following list of un-English forms of the chief centres of past publication will be useful (for a full one, see ‹Dictionnaire de Géographie Ancienne,› Paris 1870).

Argentoratum: Strassburg.
Augusta, Augusta Vindelicorum: Augsburg.
Basilea: Basle.
Bipontum: Deux-Ponts, Zweibrücken.
Bnezieh: Venice.
Bononia: Bologna or Boulogne.
Cadomum: Caen.
Cæsaraugusta: Saragossa.
Cantabrigia: Cambridge.
Ceulen: Cologne.
Civitas Tricassina: Troyes.
Colonia, Colonia Agrippina, in civitate Coloniensi: Cologne.
Corona: Cronstadt.
Cuelen: Cologne.
Dordrechum or Dortracum: Dort.
Eboracum: York.
Eleutheropolis (''Freetown''): Freistadt, Francavilla, Francheville, etc. Also a disguise name.
Enetiai (Greek): Venice.
Gippesvicum: Ipswich.
Gratianopolis: Grénoble.
Hafnia: Copenhagen.
Hala: Halle.
Herbipolis ("plant-town"): Würzburg.
Holmia: Stockholm.
Insula or Insulæ ("the Isle," l'Isle): Lille.
Irenopolis (" City of Peace "): Berœa, properly, but used as a disguise name.
Ispalis: Seville.
Keulen, Kuelen: Cologne.
Leodicum: Lège.
Leucopetra ("Whitestone"): Weissenfels.
Lipsiæ: Leipzig.
Lugdunum: Lyons.
Lugdunum Batavorum: Leyden.
Lutetia: Paris.
Massilia: Marseilles.
Matisco: Macon.
Mediolanum: Milan.
Mleczi, Mljetka, Mnezik: (Slav.) Venice.
Moguntiacum: Mainz.
Mons Regalis: Mondovi.
Mussipons: Pont-à-Musson.
Neapolis: Naples.
Neapolis (''Newtown'') Casimiriani: Neustadt on the Hardt.
Œnipons: Innsbrück.
Olisipo: Lisbon.
Oxonia: Oxford.
Petropolis: Saint Petersburg.
Probatopolis ("Sheeptown"): Schaffhausen.
Pontimussum: Pont-à-Musson.
Regiomontium (''Kingsmount''): Königsberg.
Rotomagus: Rouen.
Sarum (i.e., Sarisbariæ): Salisbury.
Tarvistum: Treviso.
Tornacum: Tournay.
Trajectum: Utrecht.
Trecæ: Troyes.
Tridentum: Trent.
Turoni: Tours.
Ulisipo, Ulyssipo, Ulyssopolis: Lisbon.
Ultrajectum: Utrecht.
Venetia, Venetiæ, Venezia, Venedig, Wenez (local dialect): Venice.

Pagination.— Books were printed at first exactly like manuscripts, without numbering the pages. Soon the unhandiness of this method, and the difficulty of making references, forced a numbering of the leaves; which was shortly succeeded by numbering the pages, and in some cases — of very large, closely printed books — by numbering the columns, which is occasionally done for like reasons in modern times. Books of more than one volume are usually paged separately, but in many large sets the paging is carried consecutively from beginning to end, especially where it is likely to be issued in more than one edition and divided into differing numbers of volumes; since in that case one index will answer for all, instead of having to be made over for each. In the old folios and quartos, letters were often inserted on the margin, to break the page or column into separate portions without interfering with the continuity of the text; these marginal references from the first editions of classics are often left in the modern editions, forming a convenient method of reference from one to the other. Essentially the same method is followed in some modern books, but usually by numbers instead of letters, dividing off the text into tens and fives of lines, for convenient citation and reference; in some editions of the Bible the chapters and conventional verses are marked off in the same way, to keep the original paragraphing and continuous narrative and yet be easy of comparison with the common Bibles.

Prefaces, Dedications, etc.— An *introduction* is properly a part of the body of the text, outlining its theme and the main divisions of the argument or narrative, or setting forth the general conditions from which the special theme is isolated and enlarged for study; the *preface* (for which among certain ultra-Teutonists the disagreeable affectation «foreword,» German *Vorwort,* is substituted) is properly the author's introduction of himself or his work to the reader, explaining his general purpose, the need or place of his book, personal thanks, or comments, etc., and all such matter as needs to be stated yet is not pertinent to the exact subject. In old times it was like the prologue or epilogue to a play, a method of ingratiating one's self with the reader, bespeaking his indulgence or removing any unfavorable impressions with which he might begin the book; and was addressed to the «courteous reader» or the «gentle reader» (which properly meant an assumed *feminine* reader), etc. The *dedication,* in times when there was no general book-market and an author must depend on the patronage of some person of rank (that is, down to the 18th century, and well into that), was an integral and indispensable part of the book: it meant that the author asked the patron to give him money and place in return for being celebrated, just as the old chiefs did their bards. He must have his Mæcenas; without him he would starve, with him he could disregard the masses. Sometimes, with men of hard, bold natures and a keen scent for the worst side of human life, like Martial or Aretino, they used disguised (very little disguised) threats and virtual blackmail as a supplement to appeal, and fawned and snarled alternately. In those times it was often nauseous with fulsome laudation; it is now of the simplest form, a mere survival used to express the author's liking or gratitude for some one, or acknowledgment of inspiration or encouragement, or in humorous books often a joke like the text.

Printers' Emblems.— These are the «bookplates» of the publishers, used not to imply ownership of the copies, but the credit of the work. They have been treated by Berjeu in ‹Early Printers› (1866), by Silvestre in ‹Marques Typographiques› (2 vols., 1867), and there was an old work of Roth-Scholtz (Nuremberg 1730); it has also been touched on by John Hill Burton in his 'Book-Hunter.' Among them may be cited the three-masted ship of Mathis van der Goes of Antwerp, 1472–94; the windmill of Andrew Myllar, Edinburgh, 1508 and later; the curious wild men and fruit-laden tree of Thomas Davidson of Edinburgh, in 1541; the Stephenses' olive-tree, and the Elzevirs' sphere. Often there is a punning allusion to the publisher's name; Froschover (*Frosch* in German is frog) has frogs; Le Chandelier, a seven-branched candlestick; and Nicholas Eve has a picture of Eve giving Adam the forbidden fruit. Others use instead the armorial bearings of their cities; Leeu, the castle of Antwerp; R. Hall, Geneva's half-eagle and key on a shield; Stadelberger, the lion rampant of Heidelberg, and the diapered shield of Zürich. Ascensius, 1462–1532, has a most vividly accurate representation of his great printing press, with a pressman pulling a proof. His device bore the inscription, «Prelum Ascensianum»; and it was adopted by Jossé Bade of Paris, 1501–35, who added his initials at the foot; by De Gourmont, 1507–15; Le Preux, 1561–87; and in a modified form by De Marnef, 1567, and De Roigny, 1565. The Aldi had an anchor and a dolphin, which was employed by Turrisan, De Chenney, Brillard, Tardif and Coulombel — sometimes, as in Coulombel's case, with the divided Aldus.

Decoration.— Besides the illustration of the text by pictures, either as frontispiece or interleaved, there are certain artistic forms which are merely decorative accessories to the book as such. The titlepage may have some of its lines or letters printed with colored inks; the printer's emblem or some suitable vignette may be inserted; or even the whole title may be engraved, as often in the 16th and 17th centuries, when it was frequently an exceedingly elaborate and costly affair, and in some modern *éditions-de-luxe* these engraved titlepages are works of extraordinary beauty. There are also ornamental initials, as with the illuminated manuscripts; head and tail pieces, in the blank at the head of a chapter or the space left at the end. The first printers often left the initial letters off altogether, or put in a small one as a guide to the artist, who inserted them by hand, using red ink, from which he was called a *rubrisher;* he also used his taste in other decorative details, being in fact the illustrative artist of the time.

Technical Terms.— The sale and collection of books are too large subjects to be treated here, but a few of the names used in the second-hand book trade may be mentioned. «Unique,» «rare» and «very rare,» are intelligible as names, but need judgment in their acceptance. A book may be unique because it was not worth keeping, like disused textbooks; the term does not imply any special value. Or it may be so because the original edition was limited to enhance its value, a very common device. In all such cases there must be knowledge and sense to estimate properly the intrinsic or factitious worth of the book. «Edition» means nothing whatever; properly it should mean all the issue of a book that the publisher thinks the market will bear at one time, and once it did mean that, but it has long ceased to have any definite connotation. As above, the «edition» may be artificially limited to a small number of copies with a promise to destroy the plate; on the other hand, a popular novel may sell many thousands and each thousand be called an «edition,» so that it may be said to have passed through 50 «editions.» «Thousand» is the honester word, and is now more used by the larger houses. «Curious» is a euphemism for a much less dainty word. «Foxed» means damaged by brown or yellow spots. «Uncut» does not mean that the leaves have not been opened with a paper-knife, but that the original size of the leaves has not been cropped by the binder. The French use *non coupé* for the former, and *non rogné* for the latter.

Bibliography.— Birt, 'Das antike Buchwesen in seinem Verhältnis zur Litteratur' (ib. 1893); Duff, 'Early Printed Books' (London 1893); Pollard, 'Early Illustrated Books' (London 1893); Madan, 'Books in Manuscript' (ib., 1893); Pollard, 'Early Illustrated Books' (London 1893); Putnam, 'Authors and their Public in Ancient Times' (New York 1893); id., 'Books and their Makers in the Middle Ages' (ib. 1896). See also BOOKBINDING; BOOKSELLING; PRINTING MANUSCRIPTS, ILLUMINATION OF, and consult works referred to under these titles.

GEORGE EDWIN RINES.

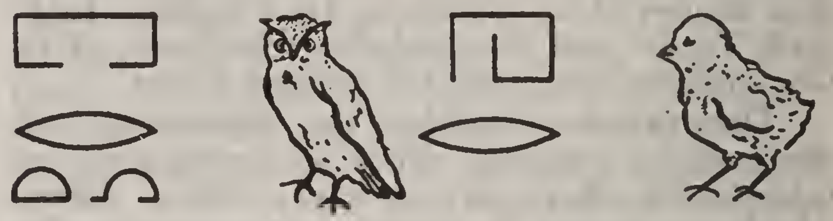
BOOK CLUB, a private association printing books for a limited number of subscribers. The members are usually learned men, and in this way render accessible rare books and manuscripts. The earliest of these clubs was the Roxburghe Club (instituted 1813), which was convivial as well as literary, and imposed on each member the cost of reprinting one publication. Its work was comparatively unimportant. With the Bannatyne Club, founded by Sir Walter Scott in 1823, began the reprinting of really important works. Other English clubs of this sort have done excellent and valuable work, among them the Camden Society (1838), whose publications relate to English history, the Percy Society (1840–52), the Hakluyt Society (1846) and the Early English Text Society (1864).

In America there were in Colonial and Revolutionary times a number of literary societies which published the writings of their own members; such was the Junto founded by Franklin in 1726. The first association established for the purpose of publishing was the 'Seventy-six Society formed in 1854, whose publications relate to the American Revolution. This Society existed for three years only, and was followed by «The Club» in New York, and by the Bradford Club. In 1858 the Prince Society of Boston was established, and it still continues its work of publication. From 1858 to 1876 a large number of clubs were formed whose work was neither important nor valuable. In 1876 the Brooklyn Historical Printing Club was established, continuing its operations until 1902. It did most excellent work on historical lines. The foremost of all American clubs of this sort is the Grolier Club of New York, formed in 1884 with 50 members, now numbering about 400. Its beautiful club-room forms an ideal meeting place for the scholar and the bibliophile. Its publications are of a literary and bibliographical character and are noted for their elaborate and artistic make-up.

BOOK OF COMMON PRAYER, the name given to the service book of the Anglican churches both in England and in all countries where Anglican communities are established. Such a book is more than a mere prayer book, and this fact is made plain in the title which reads ‹Book of Common Prayer and Administration of the Sacraments and other Rites and Ceremonies of the Church.› Toward the middle of the reign of Henry VIII an attempt was made to simplify the equivalent books of the Catholic Church by turning them into English and excluding from them all that the Reformers considered «superstitious and ungodly.» But it was not until the reign of Edward VI (1549) that the first complete book embodying all the changes thus far made was compiled and published. It was the work of 13 ministers, at the head of whom were Ridley and Cranmer. But it was not until the following year that the ordination service was added. Great care was taken to change as little as possible the form of the services of public worship to which the people had become accustomed. Therefore this first attempt did not satisfy the more radical of the Reformers. So a new revision of the prayer book took place in 1552. In this, owing to the reform influences at work, numerous of the ancient Catholic ceremonies retained in the first revision were cut out. The modern ritualistic party appeals for sanction to the first revision of the reign of Edward VI, with all its ceremonies, forms and vestments. Among the changes made in this second revision was the omission of prayers for the dead, which the reformers looked upon as pagan. Other changes were introduced in the Book of Common Prayer in the reign of Elizabeth (1559). The Queen threw her influence in the scale for a return to the ceremonies admitted in the first revision, and a return to some of these was the result. Some more of these were restored under James I (1604). Under the Commonwealth the Book of Common Prayer was not only not used as a part of the state religion, but its use was strictly prohibited. The restoration of the monarchy saw another revision in the prayer book in 1662, in which the Anglican party showed little disposition to placate the Puritans or to heal the divisions that separated the Protestant bodies in England. To this revision dates the present form of the Book of Common Prayer, which has undergone some minor changes since then. Many Puritans and people with Puritan sympathies left the Established Church sooner than accept the prayer book in its new form and the practices exacted therein. Nevertheless this revised work was used in Scotland and Ireland substantially as in England. But in 1878 the Irish Church made some changes which accentuated the anti-Catholic feeling which has ever distinguished the Protestant party there. The prayer book in use in the Episcopal Church of the United States is practically that adopted by the General Convention of 1789, which was a unit in its determination to preserve the doctrine, discipline and worship of the Church of England. The Athanasian creed was omitted, certain prayers were added and the use of the cross in baptism was made optional. A very careful revision of the prayer book was made in 1892. Consult Dix, ‹Lectures on the First Prayer Book of Edward VI› (New York 1881); Maskell, William, ‹Ancient Liturgy of the Church of England› (1882); Garrison, J. H., ‹The American Prayer Book› (1887); Huntington, W. R., ‹Short History of the Book of Common Prayer› (1893); Benton, J. H., ‹Book of Common Prayer and Books Connected with its Origin and Growth› (1914).

BOOK OF DAYS, The, a noted work edited by Robert Chambers, 1863. It has for its sub-title ‹A Miscellany of Popular Antiquities in Connection with the Calendar.› In bringing it out the editor expressed a desire to preserve interest in what is «poetical, elevated, honest and of good report, in the old national life»— recognizing the historical, and even the ethical, importance of keeping this active and progressive age in touch with obsolescent customs, manners and traditions. Beginning with 1 January each day of the year has its own curious or appropriate selection, and its allowance of matters connected with the Church Calendar, — including the popular festivals, saints' days and holidays — with illustrations of Christian antiquities in general.

BOOK OF THE DEAD, The. The literal translation of the hieroglyphic title is:

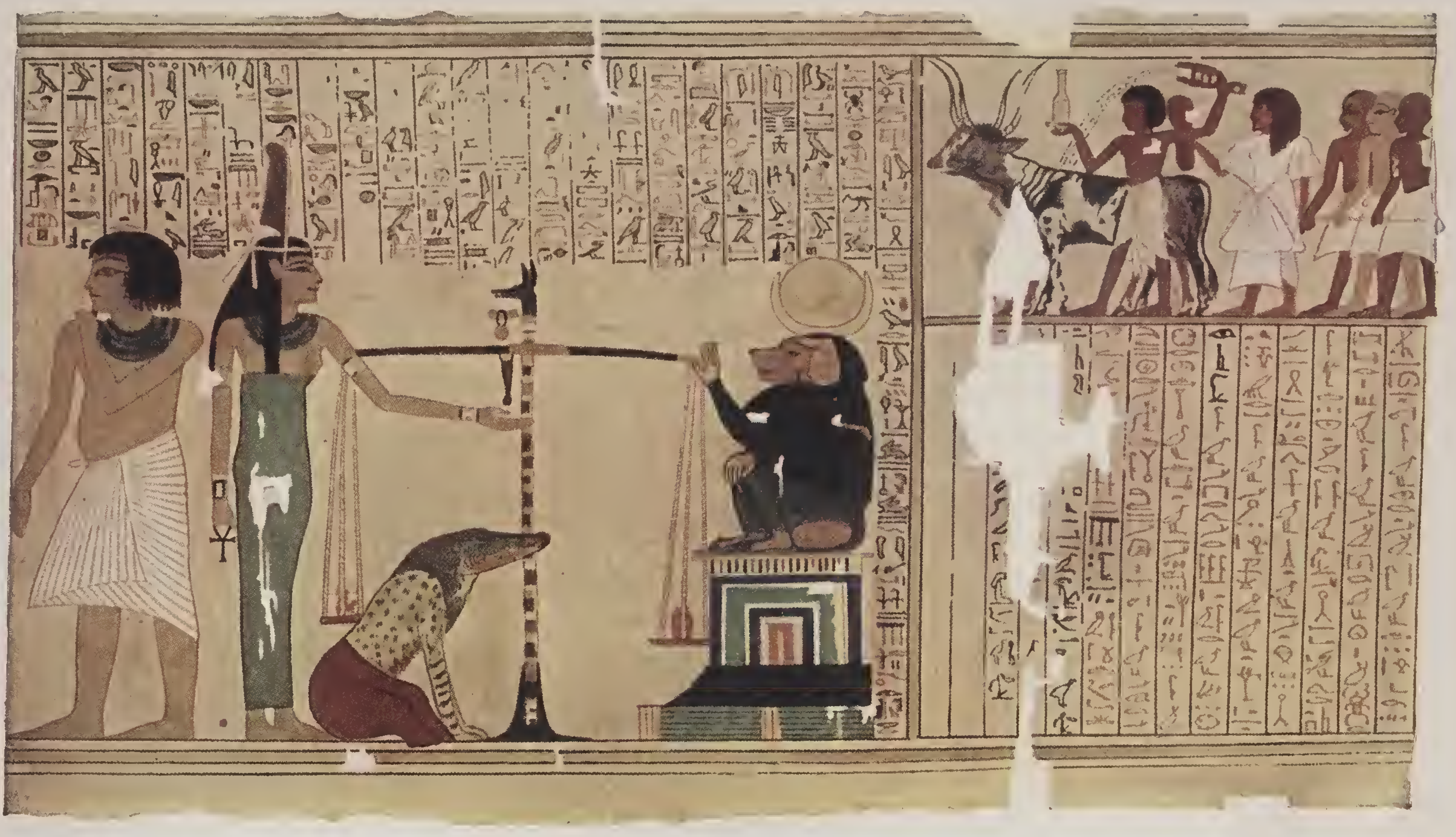


PERT EM HR — U

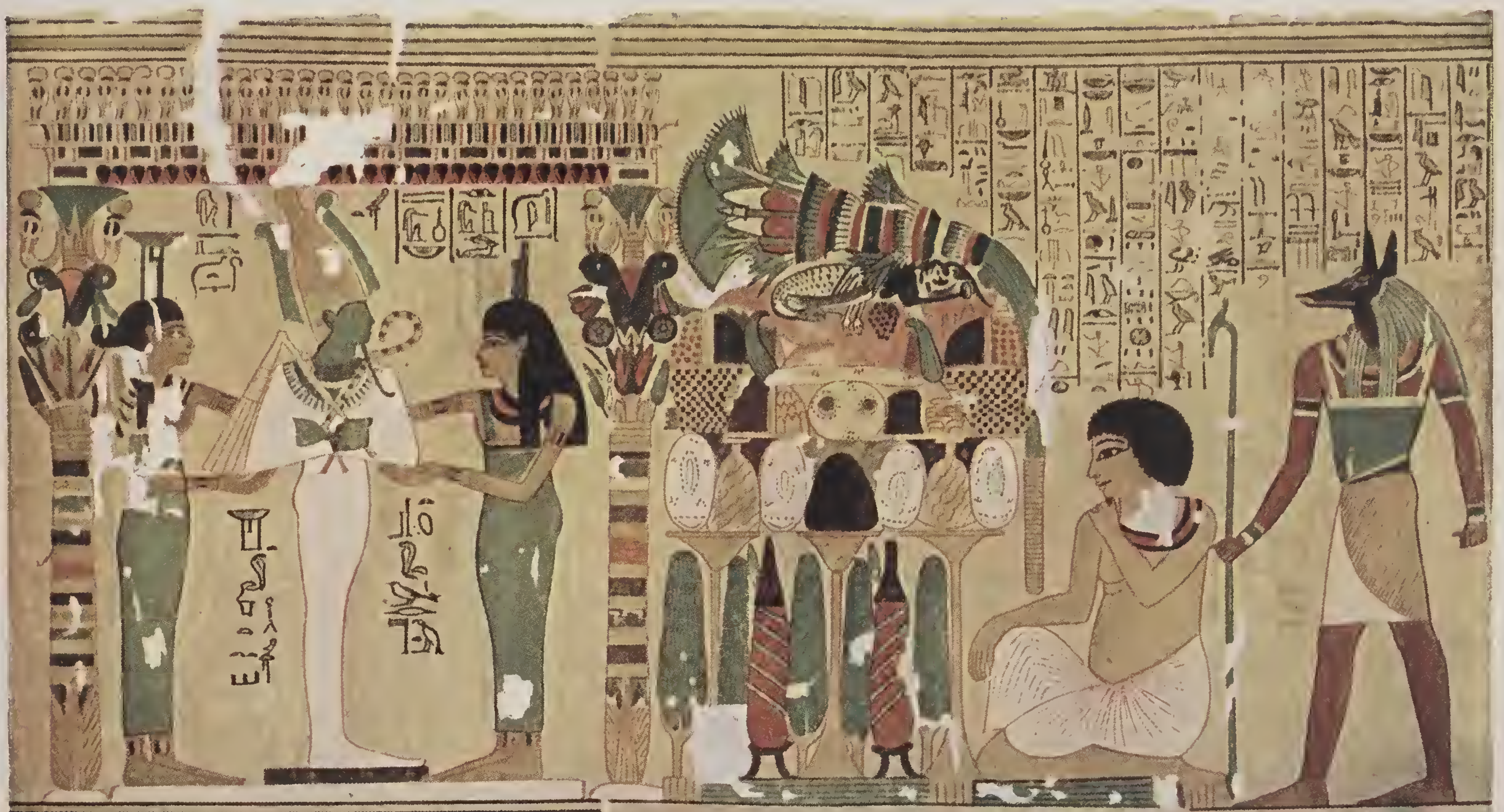
«Coming Forth by Day.» Modern Egyptologists have adopted the name given by Lepsius: *Das Aegyptische Todtenbuch,* «The Egyptian Book of the Dead.» That title, however, is considered unsatisfactory, for the simple reason that it is not one single book dealing exclusively with funeral ritual, but is a collection of books and chapters treating of psychostasia in the «Double Hall» before Osiris; the peregrinations of the *Ka* in the «valley of the shadow of death»; the Osirian doctrine of resurrection, etc.

No better laconic definition of the Book of the Dead can be given than that of the late Sir Peter le Page Renouf. He says: «It is not a book in the usual sense of the word; it is not a literary whole, with a beginning, middle and end; it is a mere unmethodical collection of religious compositions (chapters) as independent of each other as the Hebrew Psalms.»

Part of the Book of the Dead is of remote antiquity, dating back to the pre-dynastic period. There are numerous late copies of it in the museums of Europe and of this country, but the best and most complete copy is the Papyrus Ani, in the British Museum. It contains 186 chapters, and is beautifully illuminated; and, although about 3,400 years old (belonging to the XVIII Dynasty), it is well preserved. A facsimile of that Papyrus was published by order of the trustees of the British Museum, and translated (1895) by the eminent Egyptologist, Dr. E. A. Wallis Budge. Several excellent translations have been made into French, German and English of various papyri of the Book of the Dead. There are several versions of



MERCHANT KENNA WEIGHED IN THE BALANCE IN THE DOUBLE HALL OF JUSTICE



MERCHANT KENNA JUSTIFIED

the book extant. That of Heliopolis, which was subjected to numerous modifications and recensions, is considered the most ancient; then the Theban version of which the Papyrus Ani is an example — dating from the middle of the XVIII Dynasty. These two versions are written in hieroglyphics, in vertical columns and in cursive linear style. Two other versions of a later period are written in hieratic as well as in hieroglyphic characters. Complete translations of the Book of the Dead were made by Birch, Brugsch, Pierret, Pleyte, Massy (Davis, from the French translation by Pierret), Le Page Renouf and Budge.

The style of writing and the vignettes, representing embalming, funeral processions, weighing of the heart, etc., have undergone great changes in the course of time, and the texts of some of the Theban school in the XVIII Dynasty differ materially from later productions; i.e., the *Papyrus Ani* (Theban recension), contains 186 chapters, and the Turin papyrus, of a later period, contains only 165 chapters.

The late Sir Peter le Page Renouf, for many years keeper of the Egyptian antiquities in the British Museum, says: «Out of many manuscripts which are extant, no two contain exactly the same chapters or follow exactly the same arrangement.»

The earliest texts before the XVIII Dynasty are fragmentary, inscribed on the walls of tombs, monuments, sarcophagi, mummy cartonages, etc. The plate is one of the numerous presentations upon the walls of the Egyptian tombs of that period, many of which have been faithfully reproduced in the magnificent volumes of the Description de l'Egypt, and in Lepsius, etc. It represents part *a* of tomb XXIV, now in the Sepulchral Chamber of the Royal Museum, Berlin, showing Prince Merab, son of Khufu, the builder of the great Pyramid of Gizeh (about 4000 years B.C.) enjoying himself after his beatification with the same good things he was accustomed to have in his former life.

The sum and substance of the Book of the Dead is chapter CXXV, generally considered the most ancient. It is always connected with a vignette, which depicts the beatification of «The Osiris,» in the presence of the presiding deities in Amenti, when the «Negative Confession» and the weighing of the heart of the dead before the supreme deity in the netherworld takes place.

Before proceeding with the description of *psychostasia,* it is necessary to say a few words concerning the deities taking part in the weighing of the heart in the supreme tribunal of Osiris, called «The Double Hall,» represented in this plate.

The name which every dead Egyptian assumed was that of the chief deity of Amenti, called «Osiris.» As Osiris was considered the type of life after death, it was only natural that in the development of their mythology he should become the chief god of Amenti — the Justifier of the dead.

Osiris, according to Egyptian legend, was a prehistoric king, the embodiment of goodness. His brother, the wicked Set, becoming envious, treacherously killed him, cut the corpse in pieces and hid them in different parts of the land. Osiris' sister-wife, Isis, accompanied by her sister Nephthys, collected the scattered parts, which were then embalmed by the god Anubis. By means of magic, which Thoth, the god of letters and science, taught Isis, she resuscitated the body. Finally, Horus, son of Osiris and Isis, avenged the death of his father, by engaging Set, or Typhon, in combat and killing him. In the course of time Isis, Horus, etc., came to be considered as gods, and Osiris became identified with *Tum,* the setting sun symbolizing death; and Horus on the horizon (Her-emkhu, sometimes called Her-em-Khuti), the type of birth and resurrection.

Thus the *Ka,* whilst wandering through the regions of darkness and molested by demons, is the dead Osiris. After the weighing of his heart and if found not wanting, he is beatified and obtains new life. He is no more Osiris the dead, but Osiris Horus, the resurrected.

Plate *b* represents the weighing of the heart in the tribunal of the netherworld, *Amenti;* presided over by the supreme deity Osiris (Ausar). On the extreme right and left of the hall are two massive pillars, carved to imitate bundles of lotus stalks, fastened together near the top of the column. The deceased at the entrance to the hall is in an adoring attitude; his uplifted arms are supported by *Maat,* the goddess of truth and justice. She is always present in the Judgment Hall and is represented headless, with an ostrich feather in place of the head. Her figure, sometimes only the feather of her headgear, is placed in the scale-pan, opposite the one containing the vase with the heart.* The jackal-headed Anubis and the hawk-headed Horus superintend the weighing. In the scale-pan to the right is the weight in the shape of the goddess *Maat.* This scale is adjusted by another divinity unnamed in the hieroglyphic text. In the scale-pan to the left is a jar containing the heart of the departed. Upon the beam of the balance sits the dog-headed ape deity called *Hapi.* The little figure seated on the crook to the left represents the new birth after the justification of the «Osiris.» Close to the balance stands the ibis-headed scribe *Thoth,* with his tablets, recording the result of the weighing. Close in front of him, upon a shrine, sits the adversary (the Egyptian *Cerberus*), called in hieroglyphics *Amemit,* the devourer of the dead, in the shape of a strange being composed of three beasts: hippopotamus, lion and crocodile, ready to destroy the *Ka* in case he should, after weighing, be found wanting. Immediately facing the throne is an altar full of sacrifices, consisting of bread, geese, onions, lotus flowers, buds and burning incense. Beneath the altars are jars containing wine and other liquids for oblations. At the head of the hall is Osiris himself, sitting upon a throne which is richly decorated with *ankhs,* emblems of life and *uas,* emblems of purity. He is closely shrouded, and wears the white crown of upper Egypt, called *Atef,* ornamented with two ostrich feathers, the symbols of truth and justice; his hands crossed upon his breast, on his wrists are bracelets. He holds in his right hand the *Nekhekh,* scourge; and in his left, *Hek,* the

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*Many of the Pharaohs adopted her name in their royal titles, *i. e.*, Ramesis II styled himself *Se Ra Usur Ma*, "Son of the Sun, the Keeper of Truth."

crooked staff, symbolical of justice. Above are the 42 divine assessors, seated in two rows of 21 each, with different type of head, such as the heads of apes, serpents, crocodiles, etc., adorned with the feather representing truth and justice, and each holding in his hand a sharp-pointed knife. The *Ka* of the deceased stands, in beseeching posture, with hands raised, in front of each row of the judges.

The same chapter (125) contains the confessions of the deceased. Every one of the 42 judges whom the deceased called by their proper names had to pronounce him innocent, he emphatically affirming before each of them in turn that he did *not* commit any of the 42 sins. The negative confessions are very interesting but space forbids the mentioning of more than a few of them. The judge having to consider the crime of theft was addressed by the deceased as follows: «O Devourer of Shades, coming out of the orbits . . . I have not stolen»; another was addressed: «O Eyes of Flames, coming out of the shrine . . . I have not played the hypocrite»; «O Cracker of Bones, coming out of *Suten Khem* (Bubastis) . . . I have not told falsehoods»; «O Swallower, coming out of *Khnem* . . . I have not blasphemed»; «O Eater of Hearts, coming out of the thirty . . . I have not made conspiracies»; «O Eye in the Heart, coming out of the land of *Sahu* . . . I have not defiled the river,» etc.

Among other sins denied are: «I am not sluggish; I have not made to weep; I am not a landgrabber; I committed not adultery; I am not a slayer of man; I tamper not with the balance; I do not cheat,» etc.

Howsoever absurd the Egyptian Pantheon may appear to our eyes, we must acknowledge from the evidence of these 42 confessions, that they possessed a superior code of morality, a code which included not only our decalogue, but much of the ethical teachings and humanity of modern civilization.

The vignettes of this chapter, as we have already remarked, vary. The finer illuminated papyri made for royal personages or high priests and priestesses are exquisitely illuminated and the texts are unabridged. For instance, the Papyrus of *Nu* is more than 65 feet long. The Papyrus of *Ani* is 78 feet long by one foot and three inches wide.

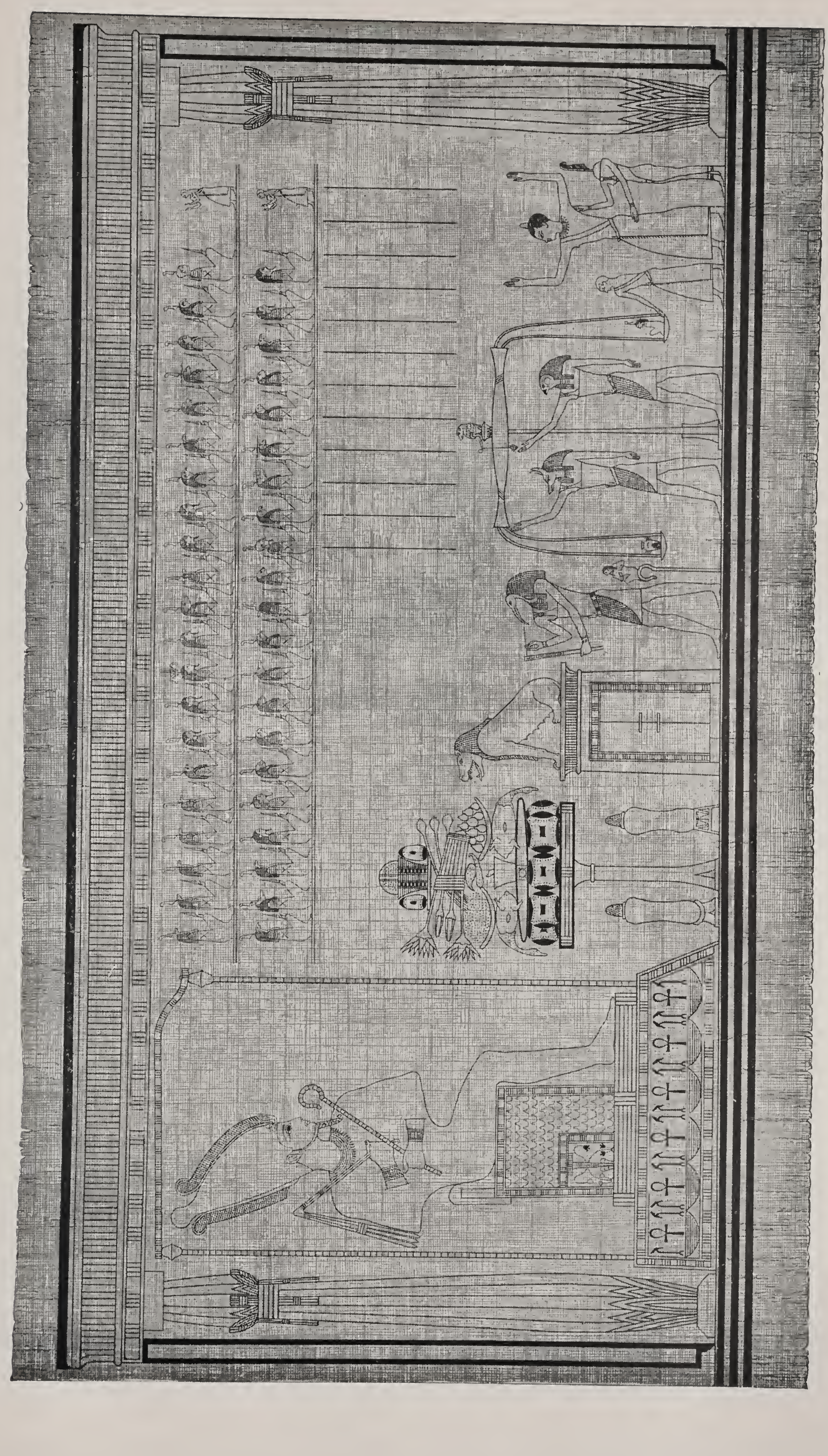
Most copies of the Books of the Dead are defective, others betray gross ignorance on the part of the scribe or copyist. The common people who were unable to purchase a well-written and illuminated text for their dead had to be satisfied with a cheaply, badly written, abridged copy. The scribes must have possessed a large stock of blanks on hand, containing spaces to be filled with the deceased (Osiris') name. Some of the Egyptian scribes were as dishonest as most of the embalmers. As the papyrus was to be placed with the mummy, the mercenary scribe or embalmer substituted a spurious for a good one.

BOOK-LICE, wingless members of the family *Psocidæ,* order *Platyptera.* These minute insects would be easily mistaken for aphides, both the wingless as well as the winged individuals. Their bodies are oval, the head free from the prothorax, which is small and partially concealed by the unequal wings. The eggs are laid in patches on leaves, bar or other objects, and are covered with a web. *Atropos divinatorius* is a small pale, louse-like insect, seen running over books and in insect cases, where it does considerable injury. It is one of the worst museum pests, especially injurious to the smaller lepidoptera. The same habit is also possessed by the well-known *Psocus domesticus.* Another species of atropos, probably *pulicarius,* has been found in Missouri, infesting the egg-mass of the cottony maple scale (*Pulvinaria innumerabilis*). See DEATH-TICK; DEATH-WATCH.

BOOK OF MORMON. A work first published by Joseph Smith in 1830, and alleged to be the English translation of an ancient record, embodying the history and more particularly the religious beliefs and practices, of the aboriginal peoples of the American continent. The period covered by the main history is approximately 1,000 years, beginning with 600 B.C., in which year a small company of Israelites left Jerusalem by Divine direction, under the leadership of the prophet Lehi. These people reached the Arabian shore, where they constructed a vessel in which they crossed the waters to the Western continent. The colony developed into two opposing nations, Nephites and Lamanites, named after their respective chieftains, Nephi and Laman. The Nephites cultivated the arts of civilization and kept a written history which was engraved by a succession of scribes on thin plates of gold. The Lamanites led a nomadic life, depended for subsistence mainly upon war and the chase, and in time degenerated into the dark-skinned race of which the American Indians are said to be the descendants. The Nephites were exterminated by their Lamanite foes about 400 A.D.

The voluminous Nephite records were abridged and summarized by Mormon, one of the later prophets, who gave to the abridgment his own name: hence the title «Book of Mormon.» The original classification into distinct books, each designated by the name of its principal author, was preserved by Mormon in his shorter history; and the modern version appears as a compilation of 15 such books. Mormon's son, Moroni, survived the destruction of his people long enough to continue the record left by his father, with which he incorporated the 'Book of Esther,' which appears as an abridged history of a colony that had been miraculously brought to America from the Tower of Babel soon after the dispersion. Moroni deposited the records together with certain other articles of sacred import in a stone box, and this he buried in a hill near Palmyra, Wayne County, in the State of New York, which hill is called in the text Cumorah.

Joseph Smith, founder of the Mormon Church, the official designation of which is «The Church of Jesus Christ of Latter-day Saints,» solemnly affirmed that in September 1823 the existence of the records was made known to him by an angelic visitant, who announced himself as Moroni, the last historian and prophet of the extinct Nephite nation, and that four years later Moroni delivered to him the plates of gold with the commission to translate certain portions, for which labor he had been qualified through the gift and power of



JUDGMENT OF THE DEAD

God. With the plates were two stones, set in the ends of a bow of metal; these, as Moroni explained, were the Urim and Thummim; and Joseph Smith averred that by their aid he was enabled to translate the ancient characters into English. The ‹Book of Mormon› comprises 623 pages, averaging 425 words to the page. From the English version translations have been made into 15 tongues.

Among the many assumptions advanced in purported explanation of the origin of the Book of Mormon and in hostile denunciation of Joseph Smith's avowal, the most generally known is the Spaulding story. This represented the Book of Mormon as an adapted version of a romance written by Solomon Spaulding, a clergyman of Amity, Pa. The claim has been thoroughly disproved. The original manuscript of the Spaulding romance is preserved in the library of Oberlin College, Ohio, where it was deposited by the president of that institution, James W. Fairchild, who published an attestation of its genuineness and a statement to the effect that no assumption of its relationship to the ‹Book of Mormon› is tenable. See Mormons; Smith, Joseph.

BOOK OF NONSENSE, A, a nursery classic by Edward Lear. It is made up from four minor collections published at intervals during a long life. The author began as an artist; colored drawings for serious purposes were supplemented by others for the amusement of the groups of little ones he loved to gather around him; and the text added to them has proved able to endure the test of time without the aid of drawing, and much of it has become part of the recognized humorous literature of the language.

BOOK-SCORPION, or **FALSE-SCORPION**, an arachnid animal of the family *Chernetidæ*; known by its large maxillary palpi, like the scorpion's claw. The abdomen is 11-jointed, flattened, without any appendage, and the living forms are minute; they breathe by tracheæ. They are found running about dusty books and in dark places and feed on mites and Psoci. They are often found attached to the leg of some fly or other insect by which they are transported about. The female chelifer bears the eggs, 17 in number, in a little bunch under her abdomen. Meuge has observed a pseudo-scorpion cast its skin in a light web made for that purpose, where it remained five days in the web after its metamorphosis, and did not assume its dark colors for four weeks; three months after it returned to the same web for hibernation. Meuge describes eight species from the Prussian amber, belonging to genera still living, and Corda one (*Microlabris sternbergi*) from the coal formation in Bohemia, an inch long. Schiödte has found a curious blind species in the caves of Adelsburg, and several kinds occur in American caves. In chelifer there are no eyes; *C. cancroides* is dark brown, with many short spines on the thorax.

BOOK-SELLING. The earliest history of book-selling is extremely obscure. The tablets and cylinders of Assyria and Babylonia will be found treated under Book, and the article Book of the Dead should also be consulted. About the middle of the 6th century B.C. is found in ancient Athens an approximation to a systematized book-trade as it has been understood in modern times. Pisistratus, with funds from the municipal treasury, paid scholars for preparing a standard text of Homer and Hesiod for copyists' use. The books then made were very costly. Diogenes Laërtius states that for three books of Philolaus (q.v.) Plato paid three Attic talents ($3,240), money being then, of course, worth far more than it now is. The first book-sellers prepared by their personal labor the scrolls they sold; then capitalists came to employ and organize staffs of copyists. About 250 B.C. Alexandria became one of the great book-centres of the world. In this it was favored by having at its disposal the scholars of the university and the facilities for distribution which the commerce of Alexandria afforded. Skilled scribes were also carefully trained there. The book-trade of Rome commenced about the 2d century B.C. Slaves who could write Greek were rated highly. The great publisher of Cicero's time, Atticus, is well known. His editions were famed for their accuracy. In addition to his central publishing house he had distributed in various portions of Rome and in provincial centres tabernarii, or retail dealers. Horace's publishers were the Sosii in the Vicus Tuscus. Argiletum, Martial says, was the street of the book-sellers, as it was, likewise, of the tailoring shops of fashion. By the close of the 1st century A.D., the Roman book-trade was extensive and well organized. Papyrus was imported in great quantities from Egypt, and large staffs of copyists were kept busy preparing editions of various works, the average edition for the general public running from 300 to 1,000 copies. Very considerable shipments were made to the provinces. During the Middle Ages book-making and selling belonged to the monasteries. The different monasteries transcribed the particular manuscripts treasured in their libraries, and their editions came to have a peculiar value, depending upon the character of the original text and the accuracy of the copy. At the beginning of the new learning, the manufacture and sale of books passed to the universities, within which the manifolding of manuscripts was done by an organized guild. Outside the universities, however, there was a considerable trade in manuscripts, beginning with the end of the 14th century. The invention of printing naturally revolutionized the book-trade. The publications of Gutenberg, Fust, Froben of Basel, Aldus Manutius of Venice, Estiennes (Stephani) of Paris, Caxton of Westminster, Plantin of Antwerp and the Elzevirs of Leyden and Amsterdam are well known. For further information, see the article Book, above referred to; and Publishing, American.

BOOK OF SNOBS, The, a series of sketches by William Makepeace Thackeray. It appeared first in *Punch*, and was published in book form in 1848. The idea of the work may have been suggested to Thackeray when, as an undergraduate at Cambridge in 1829, he contributed to a little weekly periodical called *The Snob*.

BOOK OF THE WARS OF THE LORD, an ancient work known to the Hebrews but not preserved in the sacred canons.

Several such ancient works are known to have existed in the time of Moses, and it is supposed that he drew upon them for his own writings in the Pentateuch. This 'Book of the Wars of the Lord,' is quoted or alluded to by Moses in Numbers xxi, 14.

BOOK-WORM, the «book-worm» of librarians is probably the larva of a boring beetle (*Anobium paniceum*), one of the family *Ptinidæ*. These worms are small white grubs like those of weevils, which live in various drugs, dried meat, etc. It also burrows in hard biscuits, resulting in the weevily biscuits complained of on ship-board. It more commonly bores in old furniture, causing it to be «worm-eaten.» These grubs become the beetles known as «death-ticks» or «death-watches.» Consult the various works on entomology and Blade's 'Enemies of Books.'

BOOKBINDING, the art of arranging, fastening together and covering sheets of paper composing a book, including the ornamentation or decoration of the covers. Following the use of rolls of papyrus or wax-covered tablets, leaves of parchment were introduced, and it became necessary to fasten or bind them together. This improvement in form is, on somewhat doubtful authority, attributed to Attalus II, King of Pergamus, about 150 B.C.

The monks were the early bookbinders, up to the time of the invention of printing, and examples in the British Museum dating as far back as 700 A.D. illustrate the great labor bestowed on their most precious manuscripts.

All the early specimens were bound in heavy boards, strong metal clasps and bands, and the material used in covering varied from the parchment and iron to ivory, enamels and jeweled silver and gold.

The invention of printing made a great change in the art of bookbinding, the delicate, beautiful specimens, the workmanship of Jean Grolier and many nameless Italian and French binders employed by Grolier, Macoli and others contrasted strikingly with the rather clumsy, inartistic work of the monks.

It was not until 1820 that cloth was introduced as a covering, invented, it is said, by Archibald Leighton, one of the most enterprising and successful of London binders. In the *Bookseller* of 4 July 1881 there is an interesting account by Robert Leighton of the invention of cloth by his father. The embossing of bookbinding cloth was suggested to the late Mr. de la Rue, and was carried out so admirably by him, with the appliances he possessed for embossing paper, that his process remains comparatively unaltered. The desired pattern was engraved on a gun-metal cylinder, and transferred in reverse to one made of compressed paper, strung upon an iron spindle, and turned in the lathe the exact circumference of the gun-metal one, and these two being worked together in a machine, and the pattern transferred from one to the other, the cloth was passed between them and received the impress of the pattern.

Extra work and edition work are the two classes into which bindings may be divided; extra work being bound with greater care, and largely by hand methods, forming a small portion of all books bound; edition work being the binding of quantities, principally by machinery.

The following description will apply to extra work, and methods in vogue do not differ greatly from the process of hundreds of years ago, although the use of the press and plow, hammer and backing boards is giving way to the trimming, smashing and backing machines. The first process takes the sheets from the printing press, folds them in sections of 8, 16 or 32 pages, done generally by a girl pressing each fold down with a bone folder in such a manner that the pages come in consecutive order. If a book contains 320 pages it will be seen that 20 sections or signatures are required to complete it. When all the sections are folded, they are gathered up in order and collated, that is, examined to see that each signature follows in proper sequence. Smashed or hammered, the book is then ready to sew.

Throughout the world in binderies given up to extra work will be found a frame of peculiar make called a sewing-bench. On this are stretched bands or cords of soft twine in a vertical position, and to these the signatures are attached by passing the needle and thread through the middle of the signature and around each band or cord, and the raised bands showing on back of book inform how many cords the book has been sewn on, although in many cases grooves are sawed in the back of the book into which the cords fit, and false bands are pasted on back to show the raised band effect.

The book is taken down from the sewing bench and an inch or more of twine is left on each side to be later laced through holes punched in the boards. Before this is done the marble or colored linings are pasted on the front and back of book inside the first fly leaf. Leather or cloth joints in some cases are added.

The book is then trimmed in a cutting or trimming machine; formerly the edges were trimmed by a knife called a plow while the book was clamped firmly in a press. Before cutting the back is struck forcibly against an iron plate, to square up the signature, then placed against gauge, set to position desired and clamped, knife descending and cutting book while under pressure. After trimming the three sides the book is again carefully knocked up and a thin coating of glue, sometimes flexible in character, is well rubbed in between signatures, for unless this is done the signatures will show a tendency to split open, where one signature joins another. The book is then rounded by drawing or shaping the curve, at same time beating in a peculiar manner with a flat-faced hammer, then clamped in pair of jaws, and the joints drawn over by repeated taps of hammer, or in some shops by a heavy roller set in a machine called a backing machine, which clamps the back under treadle movement. Many extra forwarders round the book before trimming, then knock the round out. After cutting, the book will spring back to its former round, leaving the front concave. In most particular classes of work the boards are laced to book before it is cut. The book is now laced to boards forming the cover and the ends of cords glued down on the inside of the cover. If the edges are to be marbled, gilt or colored, they must go through that process before books are rounded.

Marbling.— Prepared colors are thrown in a shallow trough containing gum tragacanth, on which the colors float and spread as desired. The pattern is formed by various combs that mingle the colors. The edges of the book are dipped into the liquid just deep enough for the colors to adhere, and when removed from trough, a sizing is drained over the edges, removing the surplus gum and fastening the colors more securely to edge. After edges are thoroughly dry they may be burnished with an agate or stone burnisher. Gilding is done by laying thin sheets of gold leaf on the edges of books previously scraped and smoothed with steel scraper and fine sandpaper and sized heavily with a preparation of white of egg. When dry it is then burnished with bloodstone, flint and agate burnishers.

Colored Edges.— Mix aniline colors with alcohol, adding a little ammonia to drive color in, spread over surface of edges with a fine sponge. If desired, then clamp in press and burnish. The book is then ready for the headbands, linings and cover. The headbands are merely ornamental and are woven with a colored silk, by machine or made over cords with muslin. The older process was to work over a piece of parchment with colored silks and partially fasten to back of book in the weaving or sewing. The back is then lined with strong paper glued on, the amount of stiffening varying with the size of book and style of binding, most books being made with loose backs on which false bands are glued.

Coverings.— The leather cover is dampened and covered with paste, then drawn smoothly over and turned in, over boards which have previously been laced to the book. After leather has dried, clean out joints and paste against covers the lining papers.

Finishing.— Artistic taste of the highest order finds employment in this branch of bookbinding and an expert finisher must be at once artist and craftsman of much ability. The ornamentation and lettering of fine bindings all are done by hand, the finisher bringing into use many tools and ornaments, cut on brass and fastened into small wooden handles, much depending on the manner of cutting and shaping the tools. The leather must first be prepared with paste wash and a glair or sizing generally made from the white of an egg, over which the gold leaf is laid and the tools which are heated over a gas burner are then impressed on the gold leaf, the surplus gold being brushed off with a piece of crude rubber. Upon the most careful preparation of leather, the proper heat of tools and the tooling of book before sizing is too dry, depend the brilliancy or gloss of the impression.

Ornamentation without gold is called «blind tooling» and is produced by rubbing or stamping the hot tool on the dampened leather. Few books bound now have such a wealth of ornamentation and so great an amount of time given to the finishing as was common in Grolier's time, although there are still many novel effects produced by the use of inlaid colored leathers, incised leather, etc.

After the period of Grolier, the taste for magnificent binding in France ran riot and many indulged in most sumptuous bindings and designs were prepared under the superintendence of the most celebrated artists.

During the 16th and 17th centuries bindings were produced in England which compared favorably with the contemporary masterpieces of French, Italian and German bibliography, but in the 18th century England took the leading place in the workmanlike forwarding and artistic finishing of books.

EDITION WORK.

So slow was the process of hand folding, 2,500 signatures of three folds being a fair day's work, a single 16-folding machine was built with steel points set about 15 inches apart, over which the sheet is placed, registered exactly on the points, or holes punched into the sheet as it was being printed; a knife descending makes first fold, carrying through rollers to gauges, when the second knife drops, forcing sheet through second roller, and third knife likewise, making three complete folds, and dropping them in a trough at the rate of 10,000 a day, or in other words, one machine doing the work of four hand folders.

It was soon found possible to build double 16-folding machines doing nearly 20,000 sheets daily, and at present in some of the larger edition binderies, special machines have been built which will take a sheet nearly 40x60 inches in size, and will turn out 40,000 signatures of 16 pages each, equivalent to the work of 16 girls folding by hand.

When the books are found complete, they are put through a powerful machine called a smashing machine, which compresses and makes solid the book, then to the sewing machine, where each signature in turn is laid over the arms, is carried to a position under a row of curved needles, punches concealed within the arms first make an incision through which the curved needle carries a thread meeting a looper which fastens each stitch. The first and last sheets are pasted before they are placed over the arms and when finished the book is cut apart from the following book and the thread is held by the pasting of signature from unraveling.

Following the sewing, books are resmashed, the linings and cloth joint pasted in and books are ready for trimming. If it is to be marbled or gilt, the back is tipped with glue to keep the signatures from getting out of square or becoming irregular.

Trimming.— To remove the rough and uneven edges of the signatures, the book should be cut or trimmed. This may be accomplished in the straight cutter, a machine using one knife which, making a clean, smooth cut, descends while book is clamped, in some machines with a hand clamp, in others, automatically. This machine, while very satisfactory in its results, has given way for the trimming of editions of books to automatic trimmers of various makes, which, unlike the process of trimming in the straight cutter, trims the edges of the top, front and bottom of book without removing from machine. An improvement on the automatic trimmer is a machine using two knives with each cut of machine, and while the output of this machine is very large, there has just been installed in one of our large school-book binderies a continuous cutter which permits the books to be constantly fed into the machine, and the output is so large, the machine is in a class by itself.

After trimming and gilding, marbling or coloring, it is glued over back with thin coating of glue well rubbed in between the signatures to prevent the breaking between signatures, which, while not taking from the strength of binding, looks as if poorly bound; just before glue is dried too thoroughly, book is fed against the gauges of the rounding and backing machine, the front rolls of machine drawing or rolling the round under pressure, then carried to back part of machine where a backing plate rotates against the back and forms the joints. This machine will do the work of six to eight men.

After the process of rounding and backing, headbands are prepared by forming muslin over a cord or twine; the backs of books are thoroughly glued, headbands affixed at top and bottom of back, crash lining cut to extend about one inch or more over the joints, is rubbed on with a bone folder, heavy manila paper is then glued against the book and well rubbed in, after which books, when thoroughly dried, are ready to case in, or in other words, put in the covers which have previously been prepared.

Boards called binder's boards are cut in rotary cutters to proper size for books; cloth is cut sufficiently large to overlap about one-half to three-quarters of an inch and fed over a cylinder which, revolving, carries it against glue rollers, which place a thin coating of glue thereon. This glued piece of cloth is carried to a certain part of machine and awaits the laying thereon of boards and strip of back lining paper which has been forwarded by a clever device from the rear part of machine. Grippers then carry it through rollers after end and side slides have turned in the cloth over the board and a rubber belt delivers it on stand completely finished.

Stamping.— The ornamentation of both cloth and leather covers for most bindings other than single books or single sets is rapidly and neatly accomplished by a process called stamping. Stamping was introduced to overcome the difficulty in hand tooling the cotton cloth and principally for reason of the need of a much cheaper and quicker method for lettering and ornamenting the increased quantities of books sold when the muslin or cloth was introduced as a binding for books.

The process of casing, as it is called, consists in pasting the outer end leaves of a book, placing in proper position on cover and cover then is drawn over and book shifted to secure evenness of squares or margins, then built up on press boards with brass rims which press into the joints, and after several hours' pressure, sufficient time being given to thoroughly dry, the books are removed from press, opened up and examined, wrapped and boxed for delivery.

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EDWIN S. IVES.

BOOKKEEPING. Bookkeeping is the art or science of recording business transactions in a systematic and convenient form. The objects of the record are, not merely to state what transactions took place and when they occurred, but more particularly, to determine the amounts and sources of the profits or losses during any financial period; and to show, at the end of the period, the nature and value of the assets, or things owned, and the nature of the liabilities, or things owed; and the amount of the net worth or capital.

The form of the record is columnar; columns for date, explanation and amount or money value being the least number used.

Fundamental Equation.— If a person assigns a money value to all of his assets and liabilities and if the assets are in excess of the liabilities, the difference is called that person's net worth or capital. Expressed as an equation; assets minus liabilities equal net worth; or, in an equivalent form, assets equal liabilities plus net worth. In symbols, $A = L + N. W.$ This is the fundamental equation of bookkeeping and all records are made so as to maintain its equality although the amounts of the various terms are changed by every transaction. This equation may be affected by any of the following six occurrences; (1) increase of assets; (2) decrease of assets; (3) increase of liability; (4) decrease of liability; (5) increase of net worth; (6) decrease of net worth. An increase of assets would cause an amount to be added to the left side of the equation. A decrease of assets would necessitate the subtraction of an amount from the left side of the equation; but in bookkeeping subtraction is always avoided by adding the amount to the opposite side; so a decrease of assets would be represented by adding the amount of the decrease to the right side of the equation. Similarly, an increase of liability would be an amount added to the right side of the equation, and a decrease of liability would be an additive term on the left side; an increase of net worth would be an addition to the right side, while a decrease of net worth would be added to the left side. In other words, to keep all the terms of the equation positive and avoid subtractions, the six occurrences which may affect the equation must be grouped thus:

ADD TO

Left side	Right side
Increase of assets	Decrease of assets
Decrease of liabilities	Increase of liabilities
Decrease of net worth	Increase of net worth

Every business transaction involves two elements of equal amounts and of opposite nature from the point of view of each of the parties concerned — a giving and a receiving of something of value by each of them. Or, put in the language of the above equation, every business transaction involves at least two of the six occurrences, one in each of the above groups, or one affecting each side of the fundamental equation. Thus, if merchandise be sold for cash, the asset, cash, is increased and the asset, merchandise, is decreased; or, if merchandise be bought on credit, the asset, merchandise, is increased and the liabilities are increased. Therefore, the equality of the two sides of the equation is maintained no matter what transaction takes place.

Double Entry.— Any system of recording both the opposite elements or the two occurrences of a transaction is called double entry bookkeeping. Double entry means, not that the same transaction is entered twice, but that both elements of the transaction are recorded. It is sometimes said that there is another system of bookkeeping called single entry. But it will be shown below that single entry is not really a different system but only an incomplete record or partial double entry. In the language of bookkeeping, additions to the left side of the equation are called debits; and additions to the right side are called credits. Since every transaction affects both sides of the equation by the same amount, we may say that in double entry bookkeeping, to every debit there is an equal credit and vice-versa.

Journal and Journalizing.— The analysis of a business transaction into its two or more elements or occurrences and the recording of them so as to maintain the equation or to show equal debits and credits is called journalizing; and the book in which such records are made is called a journal. The journal is a book of original entry in which the transactions are recorded in chronological order. In its usual form the journal is ruled as shown in the illustration No. 1. The name of the debit element of the transaction is written first in the explanation column with the amount in the left hand money column; the credit item is written on the next line, indented a little, with the amount in the second money column. A complete explanation should be written under each journal entry.

Rule for journalizing; analyze the transaction into its elements or occurrences and then

Debit that element which represents an increase of assets, or a decrease of liability, or a decrease of net worth;

Credit that element which represents a decrease of assets, or an increase of liability, or an increase of net worth.

Other rules for journalizing have been given, such as: debit whatever comes into the business or costs the business value; credit whatever goes out of the business or produces value for it. Debit the account that receives the benefit; credit the account that yields the benefit.

In the journal, transactions affecting the same person or thing during a given period, because of their chronological arrangement, will appear on many different pages and intermingled with transactions affecting entirely different persons or things. In order to determine the condition of the business at any time and to tell to what extent it has been a success and why, or to what extent and why it has failed to succeed, it is necessary to collect into one place or group those elements of the transactions which have affected the same person or thing. The best form into which such groups of occurrences may be put is the account.

Account.— An account is a systematic arrangement of financial facts of the same or opposite tendencies affecting the same person or thing and leading to a conclusion. Increase and decrease are the opposite tendencies and the facts must be arranged so as to separate the increases from the decreases in order to arrive at the conclusion. For every occurrence affecting an account, the date, explanation and amount are needed. The usual form of an account is illustrated by the

CASH ACCOUNT

Jan.	1	E. H. Cobb, investment	C 2	2200	—	Jan.	3	Expense	C 3	30	—
	2	A. C. Robins	C 2	120	—		4	Notes Payable	C 3	500	—
	5	Mdse sales	C 2	175	—		8	Foss & Co.	C 3	600	—
	10	Notes Receivable	C 2	800	—		12	Commission	C 3	40	—
	10	Interest	C 2	4	—		13	J. M. Pike	C 3	85	—
	11	K. M. Clark	C 4	230	—		15	Rent	C 5	75	—
	13	Mdse sales	C 4	200	—		15	Balance		2399	—
				3729	—					3729	—
Jan.	15	Balance		2399	—						

On the left or debit side appear the amounts of cash received, the increases, and on the right or credit side the amounts paid out, the decreases. The balance or conclusion of the account is the amount of cash on hand. Accounts may be divided into two classes, (1) real and (2) nominal. Real accounts are those which show the financial condition or net worth of a business. They represent real values which definitely exist and may be subdivided into asset accounts (positive values) and liability accounts (negative values). They are sometimes called financial accounts. Such accounts are: cash, real estate, machinery, etc., and accounts with persons. Nominal accounts are those which show *changes* in financial condition or net worth. They may be divided into profit or income accounts and loss or expense accounts. They are sometimes called explanation accounts because they explain the sources of gains and losses. Such accounts are: interest, discount, commission, wages, etc. They are subdivisions of or subsidiary net worth or proprietorship accounts and are eventually combined with the proprietor's capital account.

Some accounts may be partly real and partly nominal, such as the general merchandise account, and are called mixed accounts. It is best not to keep such accounts but to separate them into their component parts which are wholly real and wholly nominal. Sometimes accounts are classified as personal and impersonal; that is, accounts dealing with persons and those dealing with tangible and intangible property.

Real accounts may be either personal or impersonal, while nominal accounts are all impersonal. The proper classification of accounts is one of the most important tasks of keeping books.

Ledger.— The book in which the elements of the transactions are recorded in classified groups or accounts is called the ledger. In the journal the unit is the transaction, while in the ledger the unit is the account. The ledger is the most important book of any set of books. In it the records of all other books are collected and classified so as to show results. If the proprietor or manager wishes to know how much any person owes the firm or how much the firm is in debt to anyone, he turns to the proper ledger accounts; if he wishes to know the amount of any kind of expense for a period or the income from any particular source, he will find it in the ledger. From it he can obtain quickly and easily the effect upon the business of any class of transactions and a comprehensive view of the business as a whole. Legally, however, the journal or book of original entry is the more important one because it is the first record and less easily falsified. It holds a higher place in court in case of dispute. The process of transferring the items of the journal entries to the proper accounts in the ledger is called posting. In posting it is important that the connection between the ledger and the book of original entry should be indicated. This is accomplished by placing in the folio column of the journal opposite each entry the page of the ledger to which the posting was made; and in the folio column of the ledger account the journal page from which it came. All entries in the ledger must be posted from some other book, never made directly.

Books Used.— In theory the journal and ledger described above are the only books necessary for the double entry system. In actual practice and especially in a large business, it is impractical to keep only one book of original entry for all transactions. Therefore the journal has been subdivided into many books, each of which is used to record a particular class of transactions. It is convenient and saving of space and time to employ a sales journal or sales book in which to record only those transactions concerning merchandise sold. Other books of first entry which are split off from the journal are: Purchase Book, Notes Receivable Register, Notes Payable Register, Sales Return Book, Purchases Return Book, Cash Book, the names of which indicate their particular uses.

Since every book of original entry is used to record a particular class of transactions in each of which one element is the same, that element is not recorded for every transaction but only at the end of a period and then as a total of all the opposite elements. Thus, in the sales book illustrated each customer is debited for the amount of his purchase at the time it is made, but sales credited only at the end of the period and then for the total sales. This saves many postings to the ledger and although the

Illustration 1.— Form of Journal. (Double entry)

		Jan. 1, 1916.	L. F.				
		E. H. Cobb began this day a general merchandise business at 297 Main St., investing;					
		Building and Lot	2	1500	—		
		Merchandise	4	1600	—		
		Cash	3	2200	—		
		Foss & Co.	10			200	—
		Notes Payable	7			100	—
		E. H. Cobb, Cap.	1			5000	—
		(To record the assets and liabilities of the business and the capital)					
		Merchandise	4	1500	—		
		Foss & Co.	10			1500	—
		(Bought mdse of them on 30 days credit)					
		—— 2 ——					
		Expense	15	30	—		
		Cash	5			30	—
		(Bought a desk and chair for cash)					
		—— 3 ——					
		A. C. Robins	20	200	—		
		Merchandise	4			200	—
		(Sold him mdse on a/c)					
		—— 4 ——					
		Notes Receivable	8	400	—		
		Merchandise	4			400	—
		(Sold mdse to M. Cutts on his 30 da. note)					
		—— 5 ——					
		Cash	5	120	—		
		Merchandise	4			120	—
		(Sold mdse for cash)					
		—— 6 ——					
		Expense	15	40	—		
		Cash	5			40	—
		(Paid rent for month)					
		—— 8 ——					
		Merchandise	4	600	—		
		Notes Payable	7			600	—
		(Bought mdse of P & T Co. on our 30 day note, interest 5%)					

form of the entries differs from that of a single journal entry, yet they are of the same nature and maintain the equality of the fundamental equation. It is an invariable rule that every entry in any book of first entry is of the nature of a journal entry.

In addition to the principal books of first entry, from which postings are made to the ledger, another class of books, called auxiliary books, is sometimes employed, such as invoice book, order book, check book, inventory book, etc. No postings are made from them and they are kept merely for convenience of reference or for statistical purposes and to supply more details than are put in the principal books. Often the notes receivable and notes payable registers are used as auxiliary books and then no postings are made from them.

To prevent the ledger becoming too cumbersome and to enable several clerks to make the postings simultaneously the ledger is divided into several volumes. The personal accounts are usually separated from the real and nominal accounts and further divided into customers' and creditors' accounts. The customers' accounts are kept in a separate ledger (or if they be numerous in several ledgers), called sales or customers' ledgers, and the accounts with creditors are kept in the purchases or creditors' ledgers. The real and nominal accounts are kept in what is called the general ledger. Some accounts of a confidential nature which reflect the really vital facts of the business are often kept in a private ledger, to which only the proprietors or the manager have access. These accounts would require very little bookkeeping work and concern the investments, profit and loss, trading and capital of the firm.

Illustration 2.— Form of Sales Book

Date		Account and Explanation.	Terms.	L. F.	Extensions.		Total.	
Jan.	1	A. C. Robins	net 30 days	20			230	—
		20 bbls. potatoes @ $6.—			120	—		
		100 bu. wheat @ 1.10			110	—		
	3	C. E. Hall	2/10, N/30	21			850	—
		1000 bu. corn @ .85						
	10	K. M. Clark	net 10 days	24			800	—
		100 bbls. flour @ $8.—						
	11	G. King	2/10, N/30	25			575	—
		500 bu. wheat @ $1.15						
	30	Ross & Co.	2/10, N/30	28			1110	—
		800 bu. oats @ .60			480	—		
		700 bu. corn @ .90			630	—		
	31	J. M. Pike	net 30 days	29			300	—
		50 bbls. potatoes @ $6.—						
	31	Sales, Cr.					3865	—

Controlling Accounts.— In order that the general ledger may always be in balance so that a trial balance may be taken from it alone without balancing all of the accounts in the other ledgers, a single account is substituted in the general ledger for each class of accounts which has been taken out of it and put into a separate volume. Thus, a single account, called accounts receivable account, takes the place of all the customers' accounts which have been taken out. Such an account is called a controlling account. A controlling account is, therefore, a summary account in the general ledger, to which are posted in totals the debits and credits which are posted in detail to various separate accounts in some subsidiary ledger. In order to post to a controlling account in the general ledger the total of those items which have been posted separately to some subsidiary ledger, it is necessary to use special columnar books of original entry; that is, books in which there are separate columns for all the items which belong to particular subsidiary ledgers. These columnar books vary in form according to the number of controlling accounts kept, the nature of the business and the amount of information desired in the records.

The details of columnar books cannot be considered in this article, but the general theory involved does not differ from that of the use of the simple journal and ledger.

Opening a Set of Books.— To open a double entry set of books a statement of the kind of business and the name of the firm, with the articles of agreement or incorporation, is made on the journal, followed by an entry which debits the proper accounts with the value of each asset invested, and credits an account for each liability assumed by the business and also credits the capital accounts for the difference between the total assets and the total liabilities.

Trial Balance.— After all the transactions of a period have been entered in the books, it is necessary to know whether or not the postings to the ledger accounts have been correctly made; that is, whether the equality of the fundamental equation has been maintained. The test of this is called taking a trial balance. Since every transaction has been entered in the journal or other books of first entry with equal debit and credit sides, and since every debit and credit entry has been posted to the corresponding side of its proper account in the ledger, therefore, if the postings have been made correctly, the sum of the debits of the accounts in the ledger which are not closed must equal the sum of the credits of all those accounts.

Or the total of the debit balances of the open ledger accounts must equal the total of the credit balances. A trial balance may be defined as a list of the names of the ledger accounts, the page of each, and their debit and credit footings or balances at any specified time placed in two separate columns. (See illustration No. 3).

Illustration 3.— Trial Balance

of E. H. Cobb Company December 31, 1916.

		Capital	1			15000	—
		Mdse (1/1/16)	3	4500	—		
		Purchases	10	27300	—		
		Sales	12			56340	—
		Sales Returns	13	4250	—		
		Accounts Receivable (as per schedule)	15	13500	—		
		Accounts Payable (" " ")	17			7300	—
		Notes Receivable	18	8000	—		
		Notes Payable	19			5000	—
		Real Estate	2	12000	—		
		Mortgage Payable	8			6000	—
		Notes Receivable Discounted	20			2500	—
		Interest & Discount	21	330	—		
		Cash	7	4400	—		
		Salaries	22	5800	—		
		Salaries of Salesmen	23	2800	—		
		Selling Expenses	25	4175	—		
		Discount on Purchases	26			365	—
		Discount on Sales	27	550	—		
		General Expense	30	3400	—		
		Advertising	31	1500	—		
				92505	—	92505	—

The fact that the two columns of the trial balance add up to the same amounts is not absolute proof of the accuracy of the records. The trial balance would not show that a posting had been made to the wrong account, or that a transaction had been omitted, or that the wrong figures had been entered, or any errors of principle in the classification of accounts. It simply shows that the ledger is in balance; that the debits and credits of the original entries were equal and posted to the proper side of some ledger account. It is a summary of the ledger and forms the basis for the various financial statements and is a necessary preliminary to closing the books.

Closing the Books.— The process of ascertaining the total amount of the gains or losses during a given period and of determining the condition of the business, that is, the nature of the assets and liabilities and the amount of the net worth at the end of the period, is called closing the books. Facts affecting some of the assets and the amounts of some of the liabilities have not been recorded on the books and do not appear on the ledger. For example, furniture and fixtures and buildings and machinery, etc., may have depreciated and their former or book values should not be used in determining the true net worth. Entries are made in the journal allowing for depreciation and adjusting the values of such assets. In a trading business inventories of goods unsold must be made and placed on the books by journal entries. The inventories, sales and purchases accounts are then transferred to one account, called the trading account, in order to ascertain the gross profit on trading. Income which has been earned but not received because not yet due, such as interest on unmatured notes receivable, and expenses incurred but not yet paid, such as interest on notes payable at some future date, must be computed and the proportionate amount assigned to the period under consideration and recorded on the books in order to show the true condition. Such items are called accruals. That part of prepaid expense items, such as taxes and insurance paid in advance, properly belonging to future periods, is entered as a deferred debit item or deferred asset. Income received in advance is similarly treated as a deferred credit or deferred liability.

After the adjusting entries have been made and posted to the ledger the closing entries are made. Since the transactions and facts which affect the net worth or proprietorship have been recorded under various nominal accounts, it is necessary to combine these in order to obtain the net increase or decrease in the proprietor's interest. The closing entries are made to transfer or close out to a temporary account, called the profit and loss account, the sundry debit and credit balances of these nominal or proprietorship accounts. The balance of this profit and loss account is then closed into the proprietor's account.

After the closing entries are made, another trial balance, the proof trial balance, is drawn off to prove the final equilibrium of the ledger. Since the nominal accounts have all been closed into the proprietor's account, the proof trial balance contains only asset and liability accounts and the net worth. And since the net worth was obtained independently and must equal the balance of the assets and liabilities, a check on the records is furnished which is the fundamental characteristic of double entry.

Balance Sheet.— A balance sheet is a statement of the assets, liabilities and net worth of a business at a specified time, compiled from a set of double entry books, which are in balance after the books have been closed. (See illustration No. 4). It is the final expression of the fundamental equation after its terms have been affected by the transactions of a financial period. In content it does not differ from the *proof* trial balance. The difference between a trial balance and a balance sheet is that a trial balance is taken from the ledger *before* the nominal accounts have been closed; a balance sheet is taken from the ledger *after* the nominal accounts have been closed. There are several standard methods of arrangement of balance sheets. In the account form (as shown), one method is to list the assets on the left, in the order of their permanence, fixed assets, quick or current assets and deferred debit items; the liabilities follow a similar order on the right side, capital, secured liabilities, current liabilities, deferred credit items. A second method is almost the reverse of the first, the assets and liabilities running from the most current to the most permanent. English methods of accounting regard the balance sheet as a statement of account rendered by the business to the proprietor and place the liabilities and capital on the left with the assets on the right.

Illustration 4.— Balance Sheet of E. H. Cobb Company
as of December 31, 1916.

CURRENT ASSETS:				CURRENT LIABILITIES:		
Cash		4400		Accounts Payable	7300	
Accounts Receivable		13500		Notes Payable	5000	12300
Notes Receivable	8000					
Less — Discounted	2500	5500	23400	DEFERRED LIABILITIES:		
				Interest on Mortgage		100
DEFERRED ASSETS:						
Prepaid Advertising			500	FIXED LIABILITIES:		
				Mortgage Payable		6000
TRADE ASSETS:				TOTAL LIABILITIES:		18400
Merchandise Inventory			2540			
				CAPITAL AND SURPLUS:		
FIXED ASSETS:				Capital		15000
Real Estate			12000	Surplus		5040
			38440			38440

The «report form» of balance sheet consists of a list of the assets, usually on journal-ruled paper, with the total carried into the second amount column, followed by a list of the liabilities, the total of which subtracted from the total assets gives the net worth at the bottom. This form is becoming popular because more easily undersood by those unfamiliar with accounts.

A balance sheet must be distinguished from a statement of assets and liabilities, although they may be exactly alike in form. The latter may be prepared from single entry or any records or no records at all, while a balance sheet can be prepared only from a set of double entry books.

Profit and Loss Statement.— The profit and loss statement, sometimes called income or revenue statement, or loss and gain statement, is a classified and detailed arrangement of the income and profits made and the expenses and losses incurred during a given period. It is of equal importance and a necessary supplement to the balance sheet. The balance sheet shows the status of the business at a certain moment of time, it is a cross section, as it were, of the business at that moment. The profit and loss statement, on the other hand, covers a whole period of time between two successive balance sheets. It shows the result of all the factors which have been operating during that period and explains the difference between the two balance sheets. The profit and loss statement must not be confused with the profit and loss account, which is a summary account in the general ledger, although in its more primitive form it may be constructed from the profit and loss account and not differ much from it. Usually the statement is prepared from the nominal accounts. Their balances are classified and arranged so as to distinguish the various sources of the profits and income and to show the amount and nature of each kind of loss or expense. The profit and loss statement may be exhibited in either the account or the «report form» and is often divided into different sections, as manufacturing section, trading section, administrative section and profit and loss section. (See illustration No. 5).

Single Entry.— The simplest and purest form of single entry bookkeeping has for its object the keeping of accounts with persons only; it shows how much is due the proprietor from his customers and how much he owes his creditors. The books kept are a journal (or daybook) and a ledger. The journal may have only one money column; if it has two columns, the left hand one is used for partial amounts and the right hand one for totals. If goods are sold on account, an entry is made in the journal debiting the customer but no opposite entry is made. When the customer pays his bill, an entry is made crediting his account, but no account is debited. Likewise, when goods are bought on credit, an entry is made crediting the seller, and when he is paid his account is debited. It is necessary to write Dr. or Cr. after each entry in order to show to which side of the corresponding ledger account the amount should be posted. If no debit or credit to a personal account is involved in a transaction, no entry is made. The ledger contains only accounts with customers, showing the amounts due from them; and accounts with creditors, showing the amounts owed to them; and usually the proprietor's accounts, showing his investment and withdrawals. No property or nominal accounts are kept; therefore, no trial balance can be taken. It has been said that in single entry only one entry is made for any transaction, while in double entry two entries are made for every transaction. It would be more accurate to say that single entry records only one of the two elements or occurrences of a transaction, while double entry records both of them.

Sometimes a record of all the transactions of the business is kept in diary form and only those entries involving accounts with persons are posted to the ledger. Some sets of single entry books include a cashbook. Then it begins to encroach upon double entry because both sides of every cash transaction are recorded. But only those entries in the cashbook which involve personal accounts are posted to the ledger. Other sets of single entry books include sales and purchase books as well as a cash book and keep in the ledger some property accounts and such accounts as sales, purchases, expenses, etc., thus more closely approaching the double entry system. Such records may truly be called «incomplete double entry.»

From the single entry ledger it is impossible to construct a balance sheet as that statement is peculiar to double entry. But a statement of assets and liabilities can be made. The ledger furnishes the amount of the accounts receivable and accounts payable; the cash book, if one be kept, shows the amount of cash on hand or in the bank; all other information must be found outside the books.

Since the single entry ledger contains no nominal accounts, the only way to ascertain the profit or loss is to find the difference between the net worth as determined by the statement of assets and liabilities at the end of the period and that at the beginning of the period, taking into account also all withdrawals or additions of capital which may have taken place during the period. Since the profit or loss cannot be found independently, there is no check on the correctness of the amount.

The disadvantage of single entry is its incompleteness and lack of check on the accuracy of the entries, and on the truth of the statement of assets and liabilities and profit and loss; and lack of sources of profit and loss and of cost or other statistical data. However, single entry suffices for professional men, trustees, institutions and small retail firms interested principally in cash receipts and payments and personal accounts and not involved in transactions which might produce profit or loss from many various causes.

Historical.— The origin of bookkeeping is obscure and difficult to determine. There exist Babylonian records as early as 2600 B.C. written on small slabs of clay with a stylus; and Egyptian records written on papyrus and pictures of scribes writing down the quantities of grain brought into and removed from the government storehouses. But these are mere narratives. Money values were not recorded because money had not been invented. Neither could the effect of transactions upon the business nor the financial relations of one business to another have been expressed. The earliest example of a record kept in three columns, date, explanation and amount, is in the Advocates' Library at Edinburgh and dated 1697. But double entry was in use long before that.

ILLUSTRATION 5.— PROFIT AND LOSS STATEMENT — E. H. COBB COMPANY,

For the Year ending Dec. 31, 1916.

Trading,				
Total sales			56340 —	
Less — Returns			4250 —	
Gross income				52090 —
Inventory (1/1/16)			4500 —	
Purchases			27300 —	
			31800 —	
Less — Inventory (12/31/16)			2540 —	
Cost of Goods sold				29260 —
Gross profit				22830 —
Selling Costs,				
Salesmen's Salaries		2800 —		
Selling Expenses		4175 —		
Advertising	1500 —			
Less — Prepaid	500 —	1000 —		
Total selling costs			7975 —	
Administration Costs,				
Salaries		5800 —		
General Expense		3400 —		
Total administration costs			9200	
Total selling & administration costs				17175 —
Prime operating profit				5655 —
Other Income,				
Purchase Discount				365 —
				6020 —
Charges to Income,				
Sales Discount			550 —	
Interest & Discount			330 —	
Interest Accrued			100 —	
Total charges to income				980 —
Net profit				5040 —

About 1494 a book was published in Venice, entitled 'Everything about Arithmetic, Geometry and Proportion,' and contained an exposition of the principles of double entry. The authorship of this book has been variously ascribed to Luca Paciolo, Luca dal Borgo, de Bergo and others, all Tuscan friars. The system had probably been in use for about 200 years at that time. The first English book was published in 1543 in London by John Gough or Hugh Oldcastle. All the evidence shows that the development of the double entry system accompanied the rise in trade of the Italian merchants of Genoa, Florence and Venice during the 14th and 15th centuries. On this account it is sometimes called the Italian method.

Modern Improvements and Mechanical Devices.— Although the essential principles of bookkeeping have not changed since the theory was first developed, the practice of the art has been modified and technical methods devised with remarkable rapidity during the past few years with a view to reducing the routine drudgery of the clerical work and increasing the speed with which the records are made and the results obtained. The method of transferring the chronological record to the ledger was one of the first modifications made. Not only has the descriptive, untechnical memorial or daybook almost entirely disappeared, but the journal, from which each entry is posted to the ledger, is now generally used only for unclassified items and the adjusting and closing entries.

Many books of first entry instead of one are employed and numerous columns are provided in which items of a smaller nature, as, for example, cash, discounts and merchandise are placed in separate columns. The totals of these columns, not the individual items, are posted to the ledger. The voucher system, used extensively by manufacturing corporations, railroads and governmental departments, is a device for eliminating from the ledger many accounts with individuals. At the same time the special columns of the voucher record make possible as elaborate a classification of expenditures as is desired. These columnar records decrease the labor and time required in the preparation of detailed statements and facilitate the comparison of like items of income and expense of several different periods. Slip systems are often employed, especially for sales and orders, which enable a facsimile duplicate to be made by the aid of a carbon sheet. Postings are made from the original slips which may be sorted out in any convenient order to determine the total sales of each kind of article and then filed away for reference.

An important improvement in the form of the ledger has been the substitution of cards or loose leaves in place of a bound book. The advantages of this are: the elimination of dead accounts; the ease of keeping the accounts in alphabetical order; the facility of expanding with a growing business, and of employing many clerks to do the work simultaneously, and the ability to make the record with a typewriter or ledger posting machine. Some persons are prejudiced against cards and loose leaves on the unsupported ground that they make fraud more easy. And in some countries, as, in France, the law does not attach validity to any accounts not kept in a bound book.

The mechanical improvements and devices include various kinds of machines which relieve the bookkeeper of mathematical calculations and render inaccuracy less frequent. Cash sales registers not only record each sale and furnish a receipt to every customer but also total the sales whenever desired. There are various kinds of adding machines and many others which do multiplying and dividing as well as adding and subtracting. Card and loose leaf ledger and voucher record posting machines consist of a writing and adding machine mounted on tracks so that it may be easily moved into a position to enter the amounts in the proper columns. Order writing and billing machines designed for the records peculiar to each kind of business are used by many large mail-order and retail merchandise houses, banks, railroads and manufacturing corporations. The mechanical tabulator used by the United States census office, railroads and insurance companies is a machine which classifies and tabulates statistics by means of cards with holes punched in them. The position of each hole varies according to the facts, as the number and amount of the policy, the age of the insured, term of the insurance, premium, etc. The punched cards are run through the machine and by means of an electrical connection made whenever a hole appears the cards are sorted, the facts tabulated and certain computations made. See ACCOUNTING.

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BOOKPLATE, a printed or engraved label, usually decorative, placed on the inside cover of a book as the owner's symbol. In a certain sense, any individualized label is entitled to the name; but as usually understood, the term is restricted to those with some special artistic design, which, however, may range from the simplest to the most elaborate and ornate composition. The elements are — the owner's name; his coat of arms if he has one, usually, but not invariably; allegorical emblems or compositions; landscape designs; mottoes; quotations, etc. In purpose they are probably very ancient: some of the small tablets found in Assyrian libraries are intelligible only as book-plates, and they are accredited to Japan in the 10th century. Our modern book-plates, however, are of German descent and seem to have been nearly contemporaneous with printing, one being mentioned as of the mid-15th century; the earliest actually known, however, is a hand-colored heraldic wood-cut of about 1480, in some books and manuscripts presented to the monastery of Buxheim, Swabia. The earlier ones were all mere indices of ownership, rough wood-cuts with no artistic design; they were permanently raised into the domain of an art by the great Albrecht Dürer (1471–1528), the «father of the book-plate.» He made two for Bilibald Pirckheimer, probably before 1503 — one a mixture of armorial and allegorical elements and the other a large bold portrait of the famous Nuremberg senator; but his earliest dated one is for Hieronymus Ebner of the same city, in 1516. Several of the great German artists of that age — Holbein, Cranach, Amman and others — designed book-plates; indeed, since Dürer's time the best have not disdained this branch of art and wealthy collectors have vied with each other in costly designs.

The idea was soon adopted in other European countries. The French wrought with great delicacy and beauty, but with too elaborate and profuse decoration. The English were very late in adopting the fashion: the number of examples which have come down from before the Restoration is singularly few and the first engraved one we possess is that of Sir Nicholas Bacon, father of the chancellor, dated 1574; though an old folio volume from Henry VIII's library, now in the British Museum, contains an elaborately emblazoned drawing which formed the book-plate of Cardinal Wolsey, with his arms, supporters and cardinal's hat. But after the Restoration they multiply so rapidly that owing to the great number of wealthy English collectors, they far outnumber all the rest of the world and some of them have considerable historical interest. Pepys had several, one with initials and crossed anchors probably as early as 1668, one with his portrait not earlier than 1685. Among other English names highly prized by book-plate collectors may be mentioned Bishop Burnet, William Penn, Robert Harley, Matthew Prior, Lawrence Sterne, David Garrick, Horace Walpole, John Wilkes and Charles James Fox. Among the artists who have engraved them are William Marshall and Robert White, Hogarth, Bartolozzi, Bewick and Vertue. Bewick at one time was regularly employed in their production. One of the prettiest of book-plates is that designed in 1793 by Agnes Berry for the Hon. Mrs. Damer and engraved by Francis Legat.

The style of design, naturally, has varied with the taste of the age and is no mean index of its characteristics. The chief English styles have been classified by Lord de Tabley, the leading modern authority, as follows: Early English, entirely armorial, with profuse mantling and large full-rounded curves surrounding three and often four sides of the shield; Jacobean, from about the time of James II to 1745, with a heavy carved appearance, an even balance of proportions, always a regular outline and often a carved molding around it which makes a massive rectangular frame — a dignified and reposeful if rather formal style. The Chippendale succeeded, lighter and more graceful, with rich curves and airy scrolls, the helmet gone, no set form of shield and a profusion of careless sprays and garlands, etc. This degenerated with poor artists into an incongruous mass of overdone and rococo ornamentation, a heap of all the unrelated objects of nature and art and the most artificial frivolities of design, portraits and castles and ruined abbeys, Watteau shepherdesses and shepherds, lambs and dragons, dogs and ships, etc. About 1770 came in the Ribbon and Wreath, with a shield decorated as the name implies, much simpler and more tasteful.

The American settlers for more than a century made no attempt at book-plates of their own manufacture: the richer colonists looked to England for everything, especially luxuries and articles of culture, and the others had no time or taste for superfluities. Naturally enough, most of these early plates belong in the southern colonies, where there was more of leisure and cultivation of the decorative side of life; but for the same reason, their more intimate connection with England and preference for its ways, as well as superior taste, they continued to use its book-plates almost exclusively long after American engravers were actively employed upon this branch of work. Very few of the old southern plates are of American design and consequently they are much less valued by collectors (except for the owner's sake, as with Washington's) than the northern; though the latter are much cruder in heraldry, design and execution. The earliest dated and signed American plate by a native engraver is that of Thomas Dering, engraved in 1740 by Nathaniel Hurd of Boston; the next is of John Burnet (1754), by Henry Dawkins, who settled in 1730–77, the best of our early engravers, though there is no doubt that an earlier one of Hurd's was that of Edward Augustus Holyoke, Philadelphia and later in New York; then comes that of Benjamin Greene (1757), by Hurd; then of the Albany Society Library (1759). Paul Revere also engraved book-plates; as did Amos Doolittle of New Haven, Peter Maverick of New York, Alexander Anderson of New York (the first American wood engraver, sometimes called the «American Bewick») and others, in the Northern States, especially around the great centres like Boston, New Haven, Philadelphia and Baltimore. They worked mainly in the Chippendale style till it gave place to the Ribbon and Wreath, and originated no new style.

The earliest book-plates were of large size, as if made specially for folios; but a smaller size soon became general and was used for books of all sizes. Some owners, however, have used different plates for different sizes; some of Sir William Stirling-Maxwell's were of gigantic proportions.

The collection of book-plates is a very modern amusement, but has risen to enormous proportions. The first collector known was Dr. Joseph Jackson Howard and his collection numbered over 100,000. Sir Augustus Wollaston Franks of London had one of some 200,000, which he left to the British Museum. A German nobleman, Count Karl Emich zu Leiningen-Westerburg, had also an exceedingly fine one. A number of large and valuable ones exist in the United States, including that of the Grolier Club, which gave in 1894 the first American public exhibition of them. There is a cosmopolite association of collectors and connoisseurs, the Ex Libris Society of London (1890), which from 1881–1908 issued a monthly journal *Ex Libris,* and there are also periodicals devoted to it in France, Germany and the United States. The American Book-plate Society was founded 1 Feb. 1913. There are regular «prices current» of book-plates among dealers and auction sales as of books. The process-reproduction of drawings has somewhat «cheapened» the book-plate, but notwithstanding this the expert graver is in good demand. E. D. French of New York, K. W. F. Hopson of New Haven and J. W. Spenceley of Boston in the United States, and C. W. Sherborn and G. W. Eve in England, are famed for their designs. The intelligent study of them is based on the work of the English poet John Byrne Leicester Warren, afterward Lord de Tabley (1835–95), who published, in 1880, his 'Guide to the Study of

Book-Plates,' which has no rival and whose classifications are universally accepted.

Bibliography.— Special works are, among others, C. D. Allen, 'American Book-Plates' (New York 1894); Castle, 'English Book-Plates' (London 1892); Fincham, 'The Artists and Engravers of British and American Book-Plates' (ib. 1897); Guigard, 'Nouvel armorial du bibliophile' (Paris 1890); Hamilton, 'French Book-Plates' (London 1892); and 'Dated Book-Plates' (ib. 1896); Hardy, 'Book-Plates' (ib. 1893); Labouchere, 'Ladies' Book-Plates' (id. 1895); Poulet-Malassis, 'Les Ex Libris français' (Paris 1875); Stone, 'Women Designers of Book-Plates' (New York 1902); Wernecke, 'Die deutschen Bücherzeichen' (Berlin 1890).

BOOKS, Censorship of. Unless we consider the burning of condemned books under the Roman emperors as a censorship, the establishment of this institution must be attributed to the popes; but it cannot be denied that it would have sprung up in a thousand other places even if it had not existed in their dominions. Soon after the invention of printing, the popes perceived the influence which this art exerted over the diffusion of knowledge. It was besides doubly dangerous at a time when the authority of the Church had been assailed, and was shaking under the load of its abuses. They endeavored therefore to prohibit first the reading, and secondly the printing, of certain literary works. They enforced the ancient decrees of the Church against the reading of heretical books, and introduced an ecclesiastical superintendency of the press in 1479 and 1496, more completely established by a bull of Leo X in 1515. In this the bishops and inquisitors were required to examine all works before they were printed, and thus to prevent the publication of heretical opinions. They went still farther: as this papal decree could not be carried into execution in all countries on account of the Reformation, they prepared an index of books which nobody was allowed to read under penalty of the censure of the Church. This index was commenced by the Council of Trent, in the fourth session of which (1546) the decree of the censorship was renewed; but it was not executed, and was finally left to the popes (25th session of 1563), by whom several such 'Indices Librorum Prohibtorum' have been published. Works of an established character, which could not well be prohibited, it was determined to expurgate. The Duke of Alva caused such an 'Index Expurgatorius' to be prepared in the Netherlands; another was drawn up at Rome in 1607; but there are serious difficulties in expurgating books. The papal government still continues the policy of prohibiting to the faithful the reading of works deemed dangerous, and the Congregation of the Index has still its place and functions at Rome.

In Germany the politico-theological controversies gave the first occasion for the introduction of this institution, as they were carried on with the greatest violence on both sides. The decree of the German Diet in 1524 prohibited them. By the Diet of 1530 a more severe superintendence of the press was established; and this was confirmed by later laws of the empire in 1541, 1548, 1567 and 1577, etc. It was also provided by the Peace of Westphalia, 1648 (Osnabr. Instr. cap. v, sec. 50), that the states should not suffer attacks on religious parties. From that time the emperors have promised, in their elective capitulations, to watch strictly over the fulfilment of this article. In the capitulations of the Emperor Leopold II, 1790, and of the Emperor Francis II, it was further added (art. vi, sec. 8), "that no work should be printed which could not be reconciled with the symbolical books of both Catholics and Protestants, and with good morals, or which might produce the ruin of the existing constitution, or the disturbance of public peace." It was, however, not difficult in most Protestant countries for individual authors or literary journals to obtain an exemption from the censorship; and many institutions, academies, universities, etc., were privileged in this way as far as concerned their regular professors. The governments sometimes protected their subjects with great energy; as for instance, that of Hanover, in the case of Putter and Schloezer. Censorship was first abolished in England. It was formerly exercised by the well-known Star Chamber, and, after the abolition of this court in 1641, by the Parliament. In 1662 it was regulated by a particular statute, but only for a certain number of years. This statute was renewed in 1679, and again in 1692 for two years more. In 1694 the right of the Crown to render the printing of writings, journals, etc., dependent on its permission,— that is, the censorship,— ceased entirely. In Holland, and even in the Austrian Netherlands, a great liberty, if not an entire freedom of the press, prevailed. All that was not permitted to be printed in France appeared in the Netherlands or in Switzerland, at Lausanne and Geneva, to the great advantage of the Dutch and Swiss book-trade.

In Sweden, by an edict of 1766, and accordingly under the aristocratical constitution, the abolition of the censorship was ordered; yet Gustavus III, personally a friend of the liberty of the press, was obliged to retain the censorship, and even to execute it with severity, during the aristocratical machinations which disturbed his reign, and which were but imperfectly counteracted in the Revolution of 1771. Gustavus IV issued an edict soon after he ascended the throne, by which the censorship was retained only in matters of religion, and was administered by the consistories. This, however, was not permanent; at first penalties were enacted, and in 1802 the censorship was entirely re-established, committed to the chancellor of the court and executed with severity. French and German books were prohibited. King Charles XIII immediately after his ascension to the throne abolished it entirely by a provisional order of 12 April 1809, which was confirmed as an article of the constitution (sec. 86) 6 June 1809. In Denmark, by a royal rescript of 14 Sept. 1770 (under the minister Struensee), the censorship was wholly abolished; neither has it been restored, though the laws by which the liberty of the press has been regulated have been changing, and have sometimes been very oppressive. In France the censorship, which had belonged to the department of the chancellor and been administered by royal censors was annihilated by the Revolution. All the constitutions, from 1791 to the Charte Constitutionelle in 1814, declare the liberty of the press one of the fundamental laws. During the republic there was no censorship, but the revolutionary tribunals took its place. Napoleon restored it in another form by the decree of 5 Feb. 1810 (Direction de l'Imprimerie). Since the Restoration it has also undergone various changes. Books of more than 20 sheets have always remained free, but the censorship has been exercised over pamphlets and journals at different periods. Under the government of the Emperor Napoleon III the censorship was re-established with new penalties and is still maintained.

In the kingdom of the Netherlands the censorship was abolished by a fundamental statute of 24 Aug. 1815 (art. ccxxvi), and this statute is still in force in the kingdom of Holland. By art. xviii of the constitution of Belgium, 1831, it is declared that the press is free and that no censorship can ever be established. In the German states the liberty of the press was much restrained till 1806, the state-attorney having till then had control over it. After 1814 several states abolished the censorship, though with very different provisions as to the responsibility of authors, printers and booksellers. In accordance with the unhappy decrees of Carlsbad, 1819, and the resolutions of the German Diet of 20 Sept. 1819, the censorship in all the states of the German confederation became one of the conditions of union, but only with regard to books of less than 20 sheets and journals. These laws were repealed in 1849, but in the course of a few years they were gradually introduced, although in a modified form, and in this form they still exist in most of the separate German states as well as in the empire. In Russia and Austria there is naturally a despotic censorship. In the United States of America a censorship has never existed, though a power somewhat akin to censorship is vested in the Post Office authorities, based on the statutory exclusion from the mails of all gambling, fraudulent and obscene publications.

Besides the different degrees of severity with which the censorship is exercised in different countries, it may be divided into different kinds, according to the field which it embraces: (1) A general censorship of the book trade and of the press, under which even foreign books cannot be sold without the consent of the censors, exists in Russia, Austria, Spain, etc. (Austria has, in the censorship of foreign books, four formulas: (a) *admittitur,* entirely free; (b) *transeat,* free but without public advertisements for sale; (c) *erga schedam,* to be sold only to public officers and literary men on the delivery of a receipt; (d) *damnatur,* entirely forbidden). (2) A general censorship of the press, extending only to books printed in the country, exists in Prussia (edict of 19 Sept. 1788; order of the cabinet of 28 Dec. 1824; law of 12 May 1851). (3) A limited censorship, only over works of less than 20 sheets and journals, is at present the law in the states of the German empire, but these old laws have for many years remained a dead letter, no publisher being ever required to present a work for inspection before publication, as is rigidly demanded in Russia. Since the outbreak of the war special restrictions on printed matter have been established in Germany and Austria, applying especially to periodical literature. See DRAMA, CENSORSHIP OF; MOTION PICTURES, CENSORSHIP OF; PRESS, LIBERTY OF THE.

BOOLAK, or **BOULAK,** a suburb of Cairo. See BULAK.

BOOLE, George, English mathematician and logician: b. Lincoln, 2 Nov. 1815; d. Cork, 8 Dec. 1864. Educated in his native place, he opened a school in his 20th year and by private study gained such proficiency in mathematics that in 1849 he was appointed to the mathematical chair in Queen's College, Cork, where the rest of his life was spent. In mathematics he wrote on 'Differential Equations'; 'General Method in Analysis'; 'The Comparison of Transcendents,' etc. In logic he wrote 'An Investigation of the Laws of Thought' (1854), an amplified edition of his earlier 'Mathematical Analysis of Logic' (1847), a profound and original work, in which a symbolic language and notation were employed in regard to logical processes.

BOOM, in fortification, and in marine defenses, a strong chain or cable stretched across the mouth of a river or harbor to prevent the enemy's ships from entering, and having a number of poles, bars, etc., fastened to it, whence the name, as, to cut or burst the boom. It often denotes a long pole employed to extend the sails of a ship, as the main boom, jib boom, etc. The term is also applied to a pole set up as a sea mark to point out the channel to seamen when navigating in shallows. The word also designates a hollow, roaring sound, as the boom of a cannon, the reverberating cry of the bittern. In recent years it is often used to denote a sudden rise in the market value of real estate, stocks or commodities; an enthusiastic popular movement in favor of any person, cause or thing, as a real estate boom, a political boom, a boom in sugar.

BOOMERANG, a weapon peculiar to the aboriginal natives of Australia, used as a missile. It is made from hard wood in the green state and is from two to four feet long, formed to a curve which may vary from an arc of 20 degrees to one of 90 degrees, or there may be a distinct angular bend in the arc. The width of the boomerang is from two and one-half to three inches, and its thickness about three-fourths inch or less. The edges are finished sharp; one surface is flat and the other convex, the greatest thickness being at one-third of the width back from the outer edge of the curve. The ends or «wings» are warped over a bed of hot coals, and upon the degree and twist of this warping depends the figure of flight which the boomerang will describe when thrown. During the perfecting of the instrument many experimental flights are tried. The ends are not warped symmetrically, one end being especially adapted to the hand, and the boomerang cannot be thrown by the other end. All efforts by the most skilful mechanics to imitate the boomerang have failed. Boomerangs are of different kinds, some being used in war, others in the chase, others for amusement. One form can be hurled so as to turn while in the air and come back almost to the place whence it was thrown. It is this peculiarity that has made the boomerang so famous, though the returning boomerang is used chiefly for amusement and rarely to bring down birds. In throwing, the weapon is grasped by one end, and, being held in a vertical position, the concave side of the arc forward, is hurled somewhat to the right of the thrower, being given a revolving motion at the same time. For a distance of perhaps 50 yards it travels a straight course; then, inclining with the top over toward the left, it takes a horizontal position and moves obliquely upward into the air. After a time it curves round, and if he so intends, comes back close to the thrower. It may move for a considerable distance at only a few feet above the ground and then suddenly rise vertically upward with great velocity. The peculiarly irregular character of its path through the air and the rapid change in its direction of movement render it a very efficient weapon for killing birds. There is also a special boomerang for killing birds capable of being thrown in a straight course of 200 yards. The Australian natives often throw the boomerang in such a way as to cause it to strike the ground about 30 feet off; this is said to impart increased velocity, and the weapon may even hit the ground a second time and rebound into the air. The war boomerang is larger and heavier than that used in hunting and requires a strong man to throw it effectively. It is warped differently from the sport boomerang, travels a perfectly straight course at great speed and at 500 feet can break a man's arm or even inflict a fatal body wound. Weapons similar to the boomerang, or kiley, as the Australians also call it, but lacking the property of returning, have been and still are used by other races, notably the ancient Egyptians and the modern Abyssinians, and also in southern India. The Hopi tribe in Arizona have a similar weapon. Sir Samuel Baker describes the latter as about two feet long and made of a piece of flat hardwood, whose end turns at an angle of 30 degrees. Various derivations of the word have been suggested, one connecting it with a root meaning strike or kill and another with the native word for wind.

BOONE, Daniel, American pioneer: b. Bucks County, Pa., 11 Feb. 1735; d. 26 Sept. 1822. He was one of 11 children. His father emigrated from England and when Daniel was very young removed with his family from Bucks into Berks County, not far from Reading, then a frontier settlement exposed to Indian assaults. It abounded with game, and thus Daniel became accustomed to a life in the woods and formed an intense love for uncultivated nature. His education was confined to a knowledge of reading, writing and arithmetic. When he was about 18 his father removed to North Carolina and settled on the Yadkin. Here, in 1755, Daniel married Rebecca Bryan and for some years followed the occupation of a farmer, but about 1761 his passion for hunting led him, with a company of explorers, along the wilderness at the head-waters of the Tennessee River. In 1764 he joined another company of hunters on the Rock Castle, a branch of the Cumberland River. He had become dissatisfied with life in North Carolina. The customs of the colony were becoming luxurious, the rich were exempt from the necessity of labor and the people were much oppressed by taxes. Boone imbibed a chronic hatred of law forms which lasted through life, and his neglect of these, in securing his titles to land, reduced him to poverty on more than one occasion.

In 1767 a backwoodsman named John Finley made an excursion farther west than had before been attempted and returned with glowing accounts of the border region of Kentucky, which he represented as a hunter's paradise. Boone headed a party of six for its exploration, leaving his Yadkin home 1 May 1769. On 7 June, in the same year, they reached an elevation from which they beheld the whole region watered by the Kentucky River and its tributaries. At this point on the waters of the Red River, a branch of the Kentucky and supposed to be within the present limits of Morgan County, they halted and hunted until December without seeing a single Indian, although they were continually on the alert for them. They then separated into parties, Boone and a man named Stewart keeping company, and on 22 December these two were surprised and captured by Indians, who robbed them and kept them prisoners for seven days, when they managed to make good their escape. Early next month Boone and Stewart were gratified by the arrival in the wilderness of Daniel's younger brother Squire and another hunter from North Carolina, bringing tidings of the family at home and a much-needed supply of powder and lead. Soon after this event Stewart and Boone were again attacked by Indians. Boone escaped but his companion was shot and scalped, and the man who came with Squire having perished in the woods, the two brothers were left alone together. On 1 May it was decided that Squire should return for supplies, while Daniel remained to take care of and increase the store of peltry. They parted, and until 27 July, when Squire returned, Daniel remained in utter solitude, without bread, salt or sugar. The brothers then continued their explorations over other parts of Kentucky until March 1771, when, taking as much peltry as their horses could carry, they returned to their families on the Yadkin, Daniel having been absent about two years, during which time he had seen no human beings but his hunting companions and the hostile Indians. He was now anxious to remove to Kentucky, and although his wife and children were easily persuaded to do so, two years elapsed before he could make the necessary arrangements. He sold his farm, and on 25 Sept. 1773, the two brothers, with their families, set out for Kentucky. At Powell's Valley, through which their route lay, they were joined by five families and 40 men well armed, but on approaching Cumberland Gap, near the junction of Virginia, Kentucky and Tennessee, they were attacked by Indians and were forced to retreat 40 miles to Clinch River, leaving six of their party slain, among whom was Boone's eldest son, James. The emigrants were much disheartened and Boone remained at Clinch River until June 1774, when Governor Dunmore sent him a message to proceed to the wilderness of Kentucky and conduct thence a party of surveyors who were believed to be in danger from the Indians. This undertaking was successful, but no incidents of it have been preserved excepting that Boone was absent 62 days, in which he traveled on foot 800 miles. While he was gone to Kentucky the Shawnees and other Indians northwest of the Ohio River became hostile. Boone was appointed to the command of three contiguous garrisons, with the commission of captain, and, having fought several battles and defeated the Indians, he returned to his family on Clinch River and spent the next winter in hunting. He was shortly after employed by the Transylvania Company, established to purchase lands in Kentucky, to explore, mark and open a road from settlements on the Holston to the Kentucky River. In the face of great dangers this was accomplished, and on 1 April 1775, a site having been selected on the bank of the Kentucky River, the party erected a stockade fort and called it Boonesborough. Boone soon removed his family to the new settlement, his wife and daughters being the first white women that ever stood on the banks of the Kentucky. The winter and spring of 1776 wore away without any particular incident, as the Indians, though by no means friendly, made no direct attack. On 14 July a daughter of Boone and two female companions were captured by a party of Indians, but next morning Boone and his companions followed the trail and surprised the Indians so suddenly that they had not time to murder their captives and the three girls were restored to their families. During the whole of 1777 Boone was employed with his command in repelling the attacks of the Indians, who were incited to the most savages deeds of cruelty by the British during the Revolutionary War. His services were of incalculable advantage to the new settlements. On 1 Jan. 1778, the people suffering greatly for want of salt, he headed a party for the lower Blue Licks to manufacture it, and on 7 February, while at some distance from the camp, he was surprised and made prisoner by a party of 100 Indians. Again in this instance his consummate knowledge of the red man's character saved him and his friends. He ingratiated himself in their regard and obtained favorable terms for his party at the Licks, who became prisoners of war under the promise of good treatment. He knew that the Indians would march to attack Boonesborough and that if he and his party resisted they would all be murdered and those at the fort massacred, as no warning could reach them. He was conducted to old Chillicothe and thence to Detroit, where he was kindly received by the English commander, Governor Hamilton. In order to baffle his captors he pretended to be very much pleased with his mode of life among the Indians, went through the form of adoption by them, having his hair pulled out excepting the scalp-lock, «his white blood washed out» in the river and his face painted. On 16 June he went out to hunt and, when out of view, started direct for Boonesborough, more than 160 miles distant, which he traveled in less than five days. He reached Boonesborough in time to warn the garrison. All supposed him dead, and his wife, under that impression, had returned with her children to North Carolina. The fort was at once put in complete order for defense, and on 8 August it was besieged by 444 Indians, led by Captain Duquesne and 11 other Canadians, having French and British colors. Summoned to surrender, Boone replied with defiance, and after a savage attack upon the fort the assailants, six times greater in number than the garrison, raised the siege, leaving 37 of their party killed and many more wounded. Boone was now promoted to the rank of major. In 1778 he went to North Carolina to see his family. The next year, having invested nearly all his little property in paper money to buy land warrants, and having, besides his own, large sums of money to invest for other people, he was robbed of the whole, about $20,000, on his way from Kentucky to Richmond, where the court of commissioners was held to decide on Kentucky land claims. In 1780 he returned with his family to Boonesborough, and in October of that year his brother, on a hunting excursion with him, was killed and scalped by the Indians and Boone himself narrowly escaped. The Indians being exceedingly troublesome, a large party of militia was formed to follow and punish them, who, against Boone's counsel, suffered themselves to be drawn into an ambuscade, and the disastrous battle of the Blue Licks followed, in which Boone lost another son and had a brother wounded. At the close of the Revolutionary War Colonel Boone returned to the quiet life of his farm and to his passion for hunting. In 1792 Kentucky was admitted into the Union as a sovereign State and as courts of justice were established, litigation in regard to land titles commenced and was finally carried to great lengths. From defective titles, Boone, with hundreds of others, lost the lands he possessed, with their valuable improvements, and thus after the vigor of his life was spent he found himself without a single acre of the vast domain he had explored and fought to defend from savage invaders. Disgusted with his treatment, he resolved to abandon Kentucky and move to the Far West, which he did in 1795. He settled first on the Femme Osage, about 45 miles west of Saint Louis, where he remained until 1804; he then removed to the home of his youngest son until 1810 and finally went to live with his son-in-law, Flanders Callaway. As the country at the time of his removal was under the dominion of Spain, on 11 July 1800, he was appointed commandant of the Femme Osage district; and as his fame had preceded him, 1,000 arpents, or about 850 acres, of choice land were marked out on the north side of the Missouri River and given to him for his official services. This princely estate he also subsequently lost because he would not take the trouble to go to New Orleans to complete his title before the immediate representative of the Spanish Crown. Having left Kentucky in debt, he was much troubled for a while by ill success in hunting, but at length he obtained a valuable store of peltry, turned it into cash, went to Kentucky, without book account, paid every one what was demanded and on his return to upper Louisiana with but half a dollar left, said that he was ready to die content. In 1812 he petitioned Congress to confirm the title to his claim of 1,000 arpents of land, which he had neglected to have done in proper form and was in danger of losing as he had everything else. He sought the aid of the Legislature of Kentucky and his petition was successfully urged in Congress, in requital for his eminent services. He continued to hunt occasionally as long as his strength remained but was obliged to give up his rifle several years before his death. Chester Harding, who in 1820 painted the only portrait of him ever taken, informs us that his first sight of the old pioneer found him lying in his bunk in the cabin, engaged in cooking a venison steak on a ramrod. His memory of immediate events was very defective but of past years as keen as ever. He was quite feeble but able to walk out with Harding every day. This portrait now hangs in the State House at Frankfort, Ky. He died surrounded by his children and descendants, some of the fifth generation, in the 88th year of his age. On 20 Aug. 1845 the remains were deposited with appropriate ceremonies in the cemetery at Frankfort. In all the relations of private life Boone was a model for imitation. In spite of his many Indian encounters he was a lover of peace, modest in disposition, of incorruptible integrity, moral and temperate. Consult Sparks' 'American Biography' (New York 1856), and Thwaites, R. G., 'Life of Daniel Boone' (ib. 1902).

George Edwin Rines.

BOONE, William Jones, American bishop: b. Walterborough, S. C., 1 July 1811; d. Shanghai, China, 17 July 1864. He was graduated from South Carolina College in 1829, was admitted to the bar, but, deciding to devote himself to a missionary life, he prepared for orders at the Virginia Theological Seminary and was ordained priest in 1837. In order to equip himself thoroughly for his work, he took a course of medical study and received the degree of M.D. from the South Carolina Medical College. He sailed for China in July 1837; in 1844 he was chosen the first American Protestant Episcopal missionary bishop to China and was consecrated at Philadelphia, 25 Oct. 1844. The remainder of his life, save for an occasional visit to the United States for rest or health, was spent in the work of his diocese. He came to be well known for his knowledge of the Chinese language. He began his translation of the Prayer Book into that tongue in 1846 and later was one of a committee appointed to secure an accurate translation of the Bible into Chinese.

BOONE, Iowa, city and county-seat of Boone County, on the Chicago & N. W., the Chicago, M. & Saint Paul and the Fort Dodge, D. M. & S. railroads, 43 miles northwest of Des Moines. It is an important milling, manufacturing and coal-mining centre and in the vicinity are large deposits of fire and pottery clays. The chief industries are the manufacture of clay products, hardware specialties, cement tile machines, hair tonic and toilet supplies, hosiery, artificial ice, blankbooks and the mining and shipping of coal. The United States census of manufactures for 1914 reported 33 industrial establishments of factory grade, employing 364 persons, of whom 256 are wage-earners, receiving annually $139.000 in wages. The capital invested totalled $875,000 and the year's output was valued at $908,000; of this, $419,000 was added by manufacture. There is also an extensive trade in agricultural produce, grain and livestock, and the shops of the Chicago & N. W. and the Ft. D., D. M. & S. railroads are located here. The city has five banks, with assets aggregating $5,000,000, six ward schools, a grammar school, a high school costing $275,000, Lutheran and Catholic parochial schools, a business college and a Bible college. Among the public buildings may be noted the court-house, the library, the hospital, O. E. S. Home, Swedish National Old Peoples' Home, Masonic Temple, Y. M. C. A. building, the post office and the armory. Boone was settled in 1848 and incorporated in 1866. The government is vested in a mayor, five councilmen and two councilmen-at-large. The government receipts average about $280,000, the expenses $260,000. The value of taxable property is $9,000,000. The water works, costing $350,000, are owned by the municipality. Pop. (1910) 10,347; (1915) 12,253.

BOONTON, N. J., town of Morris County, situated 30 miles from New York, on the Delaware, L. & W. Railroad, the Morris and Essex Canal and the Rockaway River. Boonton has a picturesque situation and is noted as a suburban residential town. Its manufactures include hats, paper, bronze, rubber, silk and storage batteries. It has a good public library, an opera house and a lyceum. In 1831 the New Jersey Iron Company established a factory here, and in the old town, about one mile distant, were established one of the first iron foundries and slitting mills in North America. Pop. 5,000.

BOONVILLE, Ind., city, county-seat of Warrick County, on the Southern Railway, 17 miles northeast of Evansville. It is a farming centre, with flour mills, manufactures of snuff and tobacco, municipal water supply and, nearby, profitably worked deposits of fire and pottery clay, coal and lumber growth. Pop. 4,000.

BOONVILLE, or BOONEVILLE, Mo., city and river port, capital of Cooper County, on the right bank of the Missouri River, here crossed by a fine railway bridge, 43 miles northwest of Jefferson City. It is built on a healthful site about 100 feet above the river. It has an important river commerce and manufactures soda-water, flour, brick, pottery, carriages, pipes, harrows, etc. The city has some reputation as a summer resort. It is the seat of the State Training School for Boys and Kemper Military School, contains Harley Park and a fine county court-house. Founded in 1818, it was incorporated in 1839 and is now governed under a charter of 1896, which provides for a mayor, elected every two years, and a city council. On 16 June 1861, a Confederate force under Marmaduke was put to flight here by Federal troops under Lyon. Pop. (1920) 4,665.

BOORDE, or BORDE, bôrd, **Andrew,** English traveler and physician: b. near Cuckfield, Sussex, about 1490; d. 1549. He entered the Carthusian order at the Charterhouse, London, and in 1521 was appointed suffragan bishop of Chichester. The rigor of the Carthusian discipline was too much for him, and about 1528 he obtained a dispensation relieving him from his vow. He then studied medicine on the Continent, returning to England in 1530, but soon afterward again visited the Continent, where he studied at the chief medical schools, including those of Orléans, Poitiers, Toulouse, Montpellier and Wittenberg. His journey extended to Rome and Compostella, and in 1534 he was again in England. His next journey was undertaken at the instance of Thomas Cromwell, in order to ascertain continental opinion about Henry VIII. In 1536 he was in Scotland, studying and practising “in a lytle vnyuersyte or study named Glasco,” and he speaks of Scotchmen as deceitful and inveterate haters of the English. During the years 1538–42 he was again on the Continent and this time he went as far as Jerusalem. While staying in Winchester his open immorality got him into trouble and he was afterward lodged in the Fleet Prison, London. Boorde, who jocularly calls himself Andreas Perforatus, was the author of several works, among which are the following: ‘Fyrst Boke of the Introduction of Knowledge’ (about 1547); a ‘Handbook of Europe,’ the first of its kind; a ‘Dyetary’ (1542); a medical treatise entitled ‘Breuyary of Health’ (1547); ‘Boke of Berdes,’ a condemnation of the beard, known only through an extant portion of a reply by another writer; a book on ‘Astronamye;’ an ‘Itinerary of England’; an ‘Itinerary of Europe’; ‘Boke of Sermons,’ etc. His ‘Fyrst Boke’ contains the first printed specimen of the Gypsy language. Many other works, such as ‘The Merry Tales of the Mad Men of Gotham,’ have been ascribed to Dr. Boorde. Dr. Furnivall edited his ‘Introduction’ and his ‘Dyetary’ for the Early English Text Society in 1870.

BOOROOJIRD, BURUJIRD, or **BOOROJERD,** boo-roo-jĕrd, Persia, a town in the province of Irak Sjemi, capital of a district of same name, 190 miles northwest from Ispahan, with a castle and several mosques. It lies in a fertile and well-cultivated valley. Pop. 25,000.

BOOT, a lengthened kind of shoe, which is among the most ancient articles of attire. The form has varied quite as much as the material of which it is made. These differences of form and material are not merely due to caprices of fashion but owe their existence in great part to climatic conditions and to the necessities of the daily life and occupations of the wearers. The lightest sandal, which simply defends the sole of the foot, is appropriate for conditions amid tropical sands, while a Greenland winter demands the closest, most warm and water-tight foot-covering that can be devised. From the elementary covering of the sandal grows up the slipper, in which straps are dispensed with and a sufficient “upper” of leather or other material provided to keep it on the foot. The short shoe is the next stage, being laced, buttoned or otherwise fastened on the foot; and in the boot the upper is continued so as to embrace more or less of the leg. Ancient foot-coverings were mostly of the sandal type and the development of these is described in the article Shoes. Here are given a few historical particulars respecting boots regularly so called. In mediæval times shoes with long, pointed toes were worn by the high-born, and toward the end of the 14th century these points became ridiculously elongated, so that there appeared to be a long strap projecting from each foot. Different kinds of half-boots were worn by the Anglo-Saxons and Anglo-Normans; and in the reigns of Edward IV, if not earlier, the boot proper, with tops and spurs, was established as an article of knightly dress. In the reign of Charles I, a species of boot, exceedingly wide at the top, made of Spanish leather, came into use; and with Charles II the highly-decorated French boot was introduced as an article of gay courtly attire. Meanwhile, the jackboot, as it is called, had become indispensable in the costume of cavalry soldiers and horsemen generally, and by William III and his followers it was generally naturalized in England. This huge species of boot remained in use in British cavalry regiments until comparatively recent times, and, in a somewhat polished and improved form, it is still worn by the Horse-Guards. The jackboot is almost entitled to be called the parent of the top-boot and some other varieties. Boots with tops of a yellow color were so commonly worn by gentlemen in the 18th century as to become a peculiarity in the national costume of the English. When Philip, Duke of Orleans, and other revolutionists of note, affected to imitate the sentiments and manners of the English, they ostentatiously wore top-boots. Among jockeys and fox-hunters, top-boots are likely to remain in permanent use. What perhaps contributed to break up their general use was the introduction of the Hessian boot as an article of walking dress. Worn over tight pantaloons, the Hessian boot was a handsome piece of attire, giving, undoubtedly, an elegant appearance to the nether costume. Boots of this shape were worn by English general officers in the early part of the French war and somewhat later. At length they were superseded by the well-known Wellington boot, which, as its name imports, was introduced by the great Duke as a simplification under the loose military trousers. When the name of Blucher was given to a half-boot, the Wellington was almost entirely abandoned in England in consequence of the universal use of short ankle-boots. It is still largely used in some continental countries and in the rural districts of the United States. At present boots are worn by cavalry and horsemen generally, though leather leggins, known as puttees, are fast becoming general. Boots are made of rubber and cloth, and in such forms are much used by those who work in water or damp places. See Boots and Shoes.

BOOTAN. See Bhutan.

BOÖTES, bō-ō'tēz (“ox-driver,” from Gr. *bous,* an ox), a northern constellation, situated to the east of Ursa Major, called also by the Greeks Arctophylax. Arcturus was placed by the ancients on his breast, by the moderns on the skirt of his coat. Fable relates that Philomelus, son of Ceres and Jason, having been robbed by his brother, Plutus, invented the plough, yoked two bulls to it and thus supported himself by cultivating the ground. Ceres, to reward his ingenuity, transferred him, with his cattle, under the name of *Boötes,* to the heavens. ε and ξ Boötis are fine double stars, the former an orange star of the third and a greenish-blue star of the sixth magnitudes; the latter's components are of magnitudes 4.6 and 6.6 respectively, the former yellow and the latter purple.

BOOTH, Abraham, English clergyman: b. Blackwell, Derbyshire, England, 20 May 1734; d. 27 Jan. 1806. He was a dissenting local preacher who, when the Baptists were first called into churches, became noted as a speaker of power and an organizer of ability. He continued to make his living by running a private school even after he had become superintendent of the Kirby-Woodhouse congregation, who wished to make him their minister. Sometime later he became a Calvinist and left the original body of Baptists to which he had belonged from boyhood. In 1768 he published 'The Reign of Grace,' and from this time on his literary activities continued unabated until his death. His works were immensely popular in Baptist religious circles and many editions of his most noted works were published. Some of them were translated into the languages of most of the countries of Europe where Baptist propaganda was then being carried on. Even to-day they are looked upon in England as the most important word on the Baptist question. Booth was ordained 16 Feb. 1769, and at once took charge of a congregation. The following year he published 'The Death of Legal Hope' and 'Life of Evangelical Obedience.' These were followed by works of a devotional, controversial or philosophical nature. Among these were 'An Apology for the Baptists' (1778); 'Pædobaptism Examined' (1784); 'Glad Tidings to Perishing Sinners' (1796); 'Pastoral Cautions' (1805); 'Commerce in the Human Species' (1792); numerous sermons, addresses and occasional works.

BOOTH, Ballington, American reformer: b. Brighouse, Yorkshire, England, 28 July 1859. He is second son of the late William Booth, founder of the Salvation Army. He was educated in a private school in Bristol, subsequently in Taunton Collegiate Institute and Nottingham Seminary, England. After a successful term in Australia as administrative head of a large evangelistic body, Commander Booth came to the United States in 1888 to take command of the American branch of the work of which his father was the head. Subsequently, as is known to the American public, Mr. Booth's connection with his father's work ceased, and on urgent representations of prominent citizens of the United States he inaugurated the new movement — The Volunteers of America, which has assumed national proportions. The Volunteers of America was incorporated 6 Nov. 1896. Mr. Booth has been twice elected as president and general-in-chief by the directors and members of the organization. He is internationally known as a writer, public speaker and philanthropist. He is also the author of a number of well-known hyms.

BOOTH, Barton, English actor: b. 1681; d. Hampstead, May 1733. He was of a Lancashire family, related to Henry Booth, Earl of Warrington, was educated under Dr. Busby, at Westminster School. An early attachment for the drama was fostered by the applause he met with while performing a part in Terence's 'Andria' at the annual exhibition in that seminary. He ran away from school at the age of 17, and joined Ashbury's company of strolling players, with whom he went to Dublin. After performing three years in the Irish capital with great applause, he returned in 1701 to London, and, engaging with Betterton, met with similar success as Maximus in 'Valentinian.' On the death of that manager he joined the Drury Lane Company and there was a great success in 1708 as the ghost in 'Hamlet,' and on the production of 'Cato' in April 1713, raised his reputation as a tragedian to the highest pitch by his performance of the principal character. It was on this occasion that Lord Bolingbroke presented him from the stage box with 50 guineas — an example which was immediately followed by that nobleman's political opponents. Declamation, rather than passion, appears to have been his forte, though Cibber speaks of his Othello as his finest character. Other rôles in which he excelled were Brutus and Henry VIII. He became a patentee and manager of the theatre in 1713, in conjunction with Wilks, Cibber and Doggett, and retired in 1728. He was buried in Westminster Abbey, where there is a monument to his memory. He was the author of 'Dido and Æneas,' a mask, various songs, etc., and the translator of several odes of Horace. Consult Cibber, «Lives and Character of Barton Booth,» in 'Lives and Characters of the Most Eminent Actors and Actresses' (London 1753); Galt, 'Lives of the Players' (ib. 1831); Genest, 'History of the Stage' (Bath 1832); Victor, 'Memoirs of the Life of Barton Booth' (London 1733).

BOOTH, Chârles, English sociologist: b. Liverpool, 30 March 1840. He was educated at the Royal Institute School, Liverpool, and is chairman of the Booth Steamship Company. He was president of the Royal Statistical Society, 1892–94; a member of the Tariff Commission, 1904, and was made a privy councillor in 1904. He has devoted great attention to the statistical aspects of social questions, and in the course of prolonged investigations has shown the close relationship that exists between casual employment and poverty and depravity. In the case of London this was illustrated by a remarkable series of street maps. His researches and the conclusions drawn therefrom had no little part in the passing of the British Old Age Pension Act, granting a weekly allowance of 5/- per week to the aged poor. He is the author of 'Life and Labor of the People in London' (1891, 1897, 1903); 'Pauperism: a Picture' (1892); 'The Endowment of Old Age' (1892); 'Condition of the Aged Poor' (1894); 'Old Age Pensions' (1899).

BOOTH, Edwin Thomas, American actor (4th son of Junius Brutus Booth, q.v.): b. near Belair, Md., 13 Nov. 1833; d. New York, 7 June 1893. His first scholastic instruction was received from Miss Susan Hyde; subsequently, despite a desultory attendance at school he acquired a fairly good English education. Early in life he accompanied his father on the latter's theatrical tours and upon Edwin devolved the duty of caring for the health and comfort of the eccentric actor. His early association with theatrical life and his inherited talent drew him toward the stage. Overcoming his father's opposition, he made his first appearance as Tressel at Boston in 1849, and thereafter appeared in various rôles in his father's company. In 1851 the elder Booth was billed in Richard III at the National Theatre, New York, and being suddenly indisposed, his place was successfully assumed by Edwin. In 1852 he went to California with his father to join his brother, J. B. Booth, Jr. He remained some years in California, where his financial success was indifferent. In 1855 he made a successful tour of Australia, New Zealand and the Sandwich Islands, returning to the United States the following year and making a tour of the South. Early in 1857 he scored an immense success as Sir Giles Overreach in ‹A New Way to Pay Old Debts,› and in May of the same year made a brilliant success as Richard III in New York. In 1860 he was married to Mary Devlin of Troy, N. Y. She died in 1863. In 1861 he went to England, where his Shylock and Sir Giles were coldly received, but his Richelieu achieved wide popularity. Henry Irving was a member of his company at Manchester during this English tour. After a visit to Paris he returned to America and in 1862 he opened the season at the Winter Garden, New York; later, with J. S. Clark, he purchased the Walnut Street Theatre in Philadelphia. A year later, with Clark and William Stuart, he took a lease of the Winter Garden Theatre, New York. Here his fame as Hamlet was at once established. After the assassination of Lincoln by his brother, John Wilkins Booth, he retired temporarily but in 1866, at the urgent solicitation of his friends, he reappeared in New York. In 1869, he married Mary McVicker, who died in 1881. In the loss of the Winter Garden by fire in 1867, Booth lost many articles of value, and all his properties. For two years he traveled to raise money for «Booth's Theatre,» which he erected on 23d street and 6th avenue, New York, at a cost of over $1,000,000. It was opened in 1869 with ‹Romeo and Juliet.› For a time the enterprise was an artistic and financial success, but it fell on evil days in the panic of 1873 and Booth became bankrupt. He amply restored his fortunes by his tours of the South, West and East in the remaining years of the '70's. In 1880, and again in 1882 he visited Europe and was received with great acclaim in England and Germany. After his return to America he repeated his former successes, touring with Helena Modjeska in 1890. In April 1891, he retired to the Players' Club, which he founded and to which he gave more than $250,000. Hamlet was Booth's most popular rôle, closely followed by his Lear and Othello. While of small stature his frame was compact and his carriage graceful. He had complete control of his voice to such an extent as to be able to express any shade of feeling or sentiment. Consult Grossman, Edwina Booth, ‹Edwin Booth; Recollections by his Daughter, and Letters to Her and to his Friends› (New York 1894); Clarke, Asia Booth, ‹The Elder and the Younger Booth› (Boston 1882); Clapp, Henry A., ‹Reminiscences of a Dramatic Critic› (Boston 1902); Hutton, Lawrence, and Matthews, Brander, ‹Actors and Actresses of Great Britain and America› (New York 1886); Winter, William, ‹The Life and Art of Edwin Booth› (New York 1894).

BOOTH, James Curtis, American chemist: b. Philadelphia, 28 July 1810; d. West Haverford, Pa., 21 March 1888. He was graduated at the University of Pennsylvania in 1829, spent one year at the Rensselaer Polytechnic Institute, and in December 1832 went to Germany and entered the private laboratory of Prof. Friedrich Wöhler in Cassel, being, it is thought, the first American student of analytical chemistry to study in Germany. Later he studied in Berlin and made a practical study of applied chemistry in European manufacturing centres. Returning to Philadelphia in 1836 he opened a laboratory for instruction in chemical analysis and applied chemistry, the first institution of its kind in the United States. This soon became widely known and attracted students from all parts of the country. Among the many distinguished chemists who studied at this institution were: Campbell Morfit, R. E. Rogers, J. F. Frazer, Thomas H. Garrett and R. T. McCulloh. In 1836 he was made professor of chemistry applied to the arts in the Franklin Institute; during 1837–38 he had charge of the geological survey of Delaware, and assisted in that of Pennsylvania; in 1849 he was appointed melter and refiner at the United States mint in Philadelphia, an office he held until his resignation, 7 Jan. 1888. His studies of the nickel ores of Pennsylvania led, in 1856, to the adoption of nickel as one of the components of the alloys used in the coinage of the 1857 cent. Publications: ‹Annual Report of the Delaware Geological Survey› (1839); ‹Memoirs of the Geological Survey of Delaware› (1841); ‹Encyclopædia of Chemistry, Practical and Applied› (1850); ‹Recent Improvements in the Chemical Arts› (Washington 1851); and he edited, with notes, a translation of Regnault's ‹Elements of Chemistry› (2 vols., Philadelphia 1853).

BOOTH, John Rudolphus, Canadian lumberman: b. Shefford County, Quebec province, 5 April 1826. He was educated at Waterloo, settled in Ottawa in 1857 and built a small shingle mill on the site of what is now his immense lumber mill. He is one of the largest owners of timber limits in Canada, and one of the most extensive manufacturers of lumber, and is the owner of great planing mills and box factories at Burlington, Vt. He has also great pulp and paper and railroading interests, his first success in the latter field being his purchase of the Canada Atlantic Railroad from Montreal to Parry Sound. He is one of the founders, a life governor and has been a munificent benefactor to Luke's Hospital, Ottawa, to which he built and presented a new wing in 1915.

BOOTH, John Wilkes, American actor (son of Junius Brutus Booth, q.v.): b. Hartford County, Md., 1839; d. 1865. He sided with the Confederates in the Civil War, and to avenge the defeat of their cause he organized a conspiracy against the life of President Lincoln, and his plot embraced also the design to assassinate the Vice-President and the members of the Cabinet. He mortally wounded the President while the latter was attending a performance in Ford's Theatre, Washington, 14 April 1865; in escaping from the building he broke his leg, and concealed himself in Virginia till the 26th, when, on being discovered, and refusing to surrender, he was shot.

BOOTH, Junius Brutus, English tragedian: b. London, 1 May 1796; d. December 1852. After fulfilling engagements at Deptford, near London, and other places, and even performing at Brussels, in 1814 he made his début at Covent Garden Theatre, London, as Richard III. His personal resemblance to the crookbacked tyrant conformed exactly to the traditions of the stage, and his personification of the character was in other respects so striking that he competed successfully with Edmund Kean, then just rising into fame. In 1821 he made his first appearance in the United States, at Petersburg, Va., and in New York, at the Park Theatre, in the succeeding year, on both of which occasions he assumed his favorite character of Richard III. From that time until the close of his life he acted repeatedly in many theatres in the United States. During the latter part of his life he resided with his family at Baltimore, making occasional professional excursions to other cities. He had just returned from a lucrative tour to California when he died. The range of characters which Booth assumed was limited, and was confined almost exclusively to those which he had studied in the beginning of his career. He is most closely identified with that of Richard, in which, after the death of Edmund Kean, he had no rival. Among his other most familiar personations were Iago, Shylock, Hamlet, Sir Giles Overreach and Sir Edmund Mortimer. In his peculiar sphere,— the sudden and nervous expression of concentrated passion,— as also in the more quiet and subtle passages of his delineations, he exercised a wonderful sway over his audience, and his appearance upon the stage has been known to awe a crowded and tumultuous house into instant silence. His presence and action, notwithstanding his short stature, were imposing, and his face, originally molded after the antique type, was capable of wonderful expression under the influence of excitement. Several of his children inherited a portion of his dramatic talent, and became prominent actors on the American stage.

BOOTH, Mary Louise, American journalist and author: b. Yaphank, Long Island, N. Y., 19 April 1831; d. New York, 5 March 1889. She was widely known as the editor of *Harper's Bazaar,* which place she held from 1867 till her death. Her ‹History of the City of New York› was the first complete work upon the subject and is still one of the best. It was published in 1859, a second edition in 1867, a third, thoroughly revised, in 1880. No book has been a greater favorite of local collectors. One copy was extended to nine large volumes and enlarged by many thousand illustrations; another, owned by the author, had 2,000 illustrations inserted; and a third was extended to 22 volumes. Miss Booth's translations number over 30 volumes. They are chiefly from the French of About, Victor Cousin, Macé Gasparin and Laboulaye. The most pretentious is Henri Martin's ‹History of France,› six volumes of which she finished.

BOOTH, Maud Ballington, a leader of the Volunteers of America: b. near London, 1865. She was active in the work of the Salvation Army in England, and established a corps of the Salvation Army in Switzerland. In 1887 she married Ballington Booth, and in 1896 joined him in seceding from the Salvation Army and organizing the Volunteers of America. She has been active in work for prisoners, both during their imprisonment and after their release. She is author of ‹Branded› (1897); and ‹Look Up and Hope,› ‹After Prison — What?› (1903); ‹Twilight Fairy Tales› (1906).

BOOTH, William, founder of the Salvation Army: b. Nottingham, England, 10 April 1829; d. London, 20 Aug. 1912. He was educated in his native town, and from 1850 to 1861 acted as a minister of the Methodist New Connection. He was from the first a zealous evangelist, but his unconventional methods shocked old-fashioned Christians. He succeeded in touching a class that had drifted away from church connection, and one of the first fruits of his new method was to organize a «star company» of converted criminals. The departure which led to the creation of the Salvation Army (q.v.) on military lines began in 1865 with mission work among the lower classes in the East End of London. Since 1877 Booth's movement has been known as the Salvation Army, of which he was the mainspring and controlling power, directing its movements at home and abroad from his headquarters in London. His enthusiasm and organizing power gave life to the religious military system of which he was «general» and which had for its primary object the evangelization and social uplift of the «submerged tenth.» The late King Edward VII gave him valuable support. In 1890 he published ‹Darkest England and the Way Out,› in which he advocated a scheme for the reclamation of unemployables by means of farm colonies. The scheme, however, for which funds were raised, did not realize expectations, but valuable work was done in the way of aiding emigration. «General» Booth's funeral, to Abney Park cemetery, evoked a wonderful demonstration of popular sympathy. His wife (née Catherine Mumford) was, until her death in 1890, a tower of strength to her husband in all his undertakings; it was she who suggested the adoption of a distinctive uniform for the members of the Army, and she designed what is known as the «Hallelujah bonnet.»

BOOTH, (William) Bramwell, Salvation Army leader: b. Halifax, Nova Scotia, 1856. After advancement in various capacities to be chief counsellor to his father, the founder of the Salvation Army, by the latter's will he succeeded as general and commanding officer, at his death in 1912.

BOOTH-TUCKER, Emma Moss, a leader in the Salvation Army: b. Gateshead, England, 8 June 1860; d. Dean Lake, Kan., 29 Oct. 1903. She was a daughter of William Booth, the organizer of the «Army»; in 1880–88, she had charge of international training homes; in 1888 she married Commander Booth-Tucker, went with him to India, and in 1896 came to the United States. She held the rank of consul in the Salvation Army, and had joint authority with her husband in the United States. She was killed in a railroad wreck.

BOOTH-TUCKER, Frederick St. George de Lautour, American evangelist: b. Monghye, Bengal, 21 March 1853. He held important official posts in India, but resigned them in 1881 to join the Salvation Army. Upon his marriage with Emma Moss Booth, daughter of «Gen.» William Booth of the Salvation Army, he prefixed Booth to his own name of

Tucker. From 1896–1904 he was commander of the Salvation Army in the United States, but resigned to become secretary of all the branches of the Army outside of Great Britain in 1904. He returned to India as special commissioner for India and Ceylon in 1907. His works include ‹Life of General William Booth› (1898); ‹Favorite Songs of the Salvation Army›; ‹Monograph for the Paris Exposition on the Work of the Salvation Army in the United States› (1900); ‹Farm Colonies of the Salvation Army› (1903).

BOOTHBY, Guy Newell, English novelist: b. Adelaide, South Australia, 13 Oct. 1867; d. Boscombe, England, 27 Feb. 1905. In 1891 he crossed Australia from north to south, and also traveled in the East. His first work ‹On the Wallaby,› was published in 1894. He wrote some 55 novels, mainly of a sensational type, including ‹A Bid for Fortune›; ‹Beautiful White Devil›; ‹Dr. Nikola›; ‹Fascination of the King›; ‹Billy Binks, Hero›; ‹Across the World for a Wife›; ‹Pharos, the Egyptian›; ‹Love Made Manifest›; ‹Dr. Nikola's Experiment›; ‹A Sailor's Bride›; ‹A Maker of Nations›; ‹My Indian Queen›; ‹Farewell Nicola› (1901); and ‹The Viceroy's Protégé.›

BOOTHIA FELIX, a peninsula on the northern coast of North America, in which is the most northern part of the continent, Murchison Point, lat. 73° 54′ N. It is joined to the mainland by Boothia Isthmus, is bounded on the north by Bellot Strait, and to the east is separated from Cockburn Island by Boothia Gulf (q.v.) It was discovered by Sir John Ross (1829–33), and named after Sir Felix Booth, who had furnished $85,000 for the expedition. Here, near Cape Adelaide, Ross discovered the magnetic pole, lat. 70° 5′ 17″ N.; long. 96° 46′ 45″ W. Consult Ross, ‹Narrative of a Second Voyage in Search of a Northwest Passage› (London 1860).

BOOTHIA, Gulf of, a southward continuation of Prince Regent Inlet in the northern part of Canada, lying between Boothia Felix on the west and Cockburn Island on the east.

BOOTLE, England, a municipal and county borough in Lancashire, near the mouth of the Mersey, and adjoining Liverpool, the docks of which great seaport extend into the borough, covering 370 acres and constructed at a cost of £2,500,000. The principal buildings are the town hall and municipal buildings, school-board offices and hospital. The trade of the town is almost exclusively connected with shipping, timber being the chief import; most of the American steamers have their loading berths here. Therre are large jute-mills, corn-mills, foundries, etc. Bootle has ample railway facilities and an excellent tramway system. The Leeds and Liverpool Canal passes through it. There is a municipal electrical station. The history of the place is included in that of Liverpool. It was incorporated in 1868. Pop. 69,876.

BOOTON, BOU'TON, or **BUTUNG,** an island of the Malay Archipelago, separated by a narrow strait from the southeast ray of Celebes, and from the island of Muna. Area, 1,700 miles. It is high, but not mountainous, and thickly wooded; produces fine timber, rice, maize, sago, etc. The people are Malays. The Sultan, who resides at Bolio, is in allegiance to the Dutch, an under-resident being stationed on the island. Pop. 17,000.

BOOTS, or BOOTIKIN, instruments of torture used in former times in the endeavor of the authorities to extort a confession from a suspect or, in the case of a witness, who might prove recalcitrant, to secure evidence. The instruments originated in Scotland, but the date of their introduction is unknown. It is well known, however, that this mode of torture was in frequent use in the latter half of the 16th century. Thus there exists a record of the torturing of a clergyman and an attorney in a forgery case in 1579, and Father Holt, a Jesuit, was sentenced by Walsingham to be «put to the boots.» After being little used for a generation this diabolical instrument was again put to frequent use during the Rebellion of the Covenanters. From then on until 1689 it was frequently used, the last recorded case being that of Neville Payne in 1689. The instrument was made of iron, or of wood and iron and fastened tightly to the leg of the victim, after which an official introduced wedges between the boot and the leg and drove these home with a mallet. The victim was interrogated after each blow and the torture continued until the information elicited was satisfactory or the victim fainted.

BOOTS AND SHOES. Boots and shoes are the two general terms denoting footwear or covering for the feet and lower leg. Specifically, a shoe is an article of footwear extending not above the ankle, while a boot not only extends above the ankle, but may reach the knee or even the upper leg. In women's footwear, this distinction is maintained, but, for men, as a general rule, any article of footwear, high or low, if buttoned, laced or otherwise closed, is known as a shoe, while boot is the term used to denote footwear extending to the knee more or less, without lateral opening and with a stiff top.

History.— The sandal, the simplest and most ancient article of footwear of which we have record, was a protection merely to the soles of the feet, rather than an adornment. It is evidenced in the art, archæology and literature of all ancient peoples, and is found even to-day as the footwear in a great part of the Orient. As culture and æsthetics increased, ornamentation was added to the sandal, and, little by little, other parts were attached, until what was the original simple protection of the sole of the foot became the sole of the modern shoe or boot. It is true, however, that in the routine of every-day domestic life it was the general custom to go with the feet bare, as is shown by the sculptures, paintings and other records. But enough evidence is at hand to show that other kinds of footwear were known and worn by the ancients. On the walls of the tombs of Thebes are paintings of the different steps in the making of footwear — from the tanning and other preparation of the leather or other material to the finished sandal or shoe, as then known. The currying knife, awl, lapstone and other tools used by the Egyptian sandal-maker were not dissimilar to the tools used by the cobbler of to-day. The emblem of the trade was a prepared skin suspended with specimens of the finished sandals in view of the public. The sandal-maker of Egypt was an important personage. Like the bootmaker of to-day, he had to cater to fashion. The Egyptians — a nation of great culture — paid great attention to the niceties of and distinctions in raiment, of which footwear was an important element. The aristocracy, and women generally, wore a sandal with a turned-up toe, pliable to the position of the foot. The lower orders wore sandals with rounded or pointed toe, or following the form of the foot. They were generally held secure by a strap extending between the great and second toes and secured at the instep to a strap attached at either side. The materials used were generally woven palm leaves or papyrus stalks or leather, with coloring and ornamentation differing according to the social position of the wearer. Shoes—of which many examples are found at Thebes — were of late date and are supposed to have originated with the Greeks. With the exception of the soles, which were thick, they were similar in appearance to the moccasin of the American Indian. The Assyrians had a sandal having a counter, attached to the foot with a number of laces tied across the instep, in some cases the sole extending forward barely to the ball of the foot. With the ancient Hebrews the sandal was likewise worn by all classes, and was made of leather or rawhide, cloth, felt or wood, secured to the feet by thongs or «latchets,» as mentioned in the Bible, in which source are found many references to this article of attire, sometimes spoken of as shoe. In certain instances they were mentioned for their beauty, being dyed, embroidered and often ornamented with precious metals and jewels. With the Greeks, the usual footwear was the sandal, from which was evolved the shoe, of which there were many styles — each worn by a different order of society. The Spartan patrician wore a red shoe; courtezans wore a white shoe; tragedians, a buskin, known as a cothurnus; and comic actors a shoe called the baxa. Numerous art remains, along with the rich Grecian literature, indicate that almost every style of foot covering known to the ancients was worn at one time or another in Greece.

For everyday wear the sandal was used by the Romans — similar in form and material to that of the Greeks. Due, however, to a more extended world intercourse, the Romans came into contact with other nations and peoples, and from these they absorbed, among other things, a diversity of dress, including footwear. Shoes, boots and buskins were common. The boot, with greavelike top — often faced with metal — was worn by the Roman soldier and was known as the *caliga* (diminutive, *caligula*). It was from this word that the Emperor Caligula received the cognomen by which history knows him — from his military career. Like the Greeks, each order of society affected a different style of footwear. The middle classes wore the *calceus,* the name that became generic for the shoe of every style. As is the custom among Eastern nations to-day, it was the custom to remove the shoes while indoors, particularly while reclining at the table, from which was derived the expression «calceos ponere» — to put on the shoes — meaning to rise from the table. Similarly, «calceos mutare» — to change shoes — signified becoming a senator, the shoes of the latter being of a special style, reaching to the middle of the leg, colored red, and bearing a silver crescent (*lunata pellis,* or *patricia luna*) just above the foot. The shoes of men were generally black, while those of the women were of various colors. Red shoes for men usually indicated the holder of some public office. The *soccus* (whence the English word «sock») — a slipper-like shoe — was worn by comedians, and the *cothurnus,* a heavy-soled buskin, similar in form and name to that of the Greeks, was worn by tragedians. From this we have the expression «sock and buskin,» signifying comedy and tragedy. Similar to the *soccus* was the *crepida,* a sandal shoe, and the *baxa* or *baxea,* derived from the Greeks, originally of plaited leaves, twigs and strips of willow and as such worn by both comedians and philosophers; later, when made of purple leather embroidered with gold, worn by women. With both the Greeks and Romans we find in the tragedian's buskin the forerunner of the modern heel. Tertullian (*de Spectaculis*) finds much offense in the «lofty buskin, impiously striving to add a cubit» (1.4505 feet) to the tragedian's stature. The Romans, probably from their intercourse with the Lombards, wore a stocking of wool, known as the *tibialia,* a footwear accessory that, when once known, has been found indispensable wherever boots and shoes are worn.

It is in the Middle Ages, with its Crusades, Feudalism and Renaissance of art and culture, that modern footwear had its beginning. In the cold northern climes where protection against the elements was a necessity, substantiality and warmth of costume were of prime importance, and the heavy boot, with its thick sole and the beginning of the heel, was one result. Feudalism, with its detached communities, chivalry, with its trappings, and the beginning of the guild system of artisan activity were incentive of individuality and improvement — by each baron having craftsmen for his every need, through feudal rivalry and by the development of the master and apprentice system, the basis of true workmanship. To appreciate this, one may with advantage examine the paintings, illumination, wood-cuts and other art remains illustrative of the beginnings and growth of modern Europe. To specify the styles of footwear alone would be to catalogue the ever-changing needs and whims of individual communities and degrees of society. The peasants, as a rule, where footwear was required, wore a simple moccasin-like shoe fitted to the foot by thongs — crudely tanned or of rawhide, sometimes with the hair side within. The Bayeux Tapestry shows King Harold on his journey to Bosham, on horseback, wearing a heelless slipper-like shoe with spurs. A Saxon chief is shown in an ancient illumination with similar footgear topped by a leggin similar in appearance to the modern puttee, while other persons of prominence are shown (Cotton MS, Claud. B. 4) with ankle-high shoes with sharp or turned-up point. During the time of Edward II we find low shoes, with heels and large buckles; and in the reign of Richard II high, tight boots, a different color for each leg, without heels and with pointed toes so long that they were frequently attached to the knee, were worn by courtiers. Following armor and its attendant protection, boots extending to the knee or higher came into vogue as a prerogative of the knights. This chivalric footgear has endured until the present, being worn by Marshal Brissac's Dragoons in 1660 and the French Dragons-Gardes and English Horse Guards of to-day. This boot, known in English as the «jack boot,» originated in Spain for the use of men of rank. Due to its finish, from its peculiar method of tanning and treatment, the leather (originally goatskin) from which it was made took the name «cordovan,» from Cordoba, and the name has been retained, being now used, as the designation of tanned horsehide. Likewise, the term «cordwainer» — a worker in cordwain, a shoemaker — is derived from the same source. It was in France, however, that the greatest liberties were taken in footgear styles and the court shoemaker of the various French kings became an important personage. Every conceit that luxury could suggest was lavished on footwear. The court slipper and the low shoe were brought to a relative perfection — the name «Louis» or French heel being that used to-day with the most popular style of ladies' shoe. Silk stockings, fancy garters, jeweled buckles and similar ornaments were added refinements. However, from the standpoint of foot-comfort there was little improvement until the middle of the 19th century. It was only around 1785 that «right» and «left» lasts were introduced into England, formerly a boot or shoe suiting either foot. In addition, the «bespoken,» or custom-made shoe or boot, while durable, was made without consideration of the anatomical principles to which it should conform.

Due to the utilization of mechanical processes, beginning in the early half of the 19th century, a standardization in manufacture and styles has resulted generally. Notwithstanding this, there are many parts of the world where, due to racial or other prejudices, little change has been made. In China the sandal, made of woven reeds, is still worn by the laboring classes, while merchants and others of the higher classes wear a loose, thick-soled, quilted slipper. It is the custom yet, to some extent, for women, their feet forcibly cramped from childhood, to wear diminutive shoes that throw the weight of the body upon the toes, incapacitating their wearers from any strenuous activity. The people of India, Turkey and Arabia, in their daily life, still cling to the ornamental sandal and low shoe, often of expensive leather and highly ornamented, that their ancestors wore. In Russia and the Balkan States, the high, heavy top-boot, made by hand, is yet worn by both men and women — heavy, weather-proof footgear being a necessity of northern Europe. In Holland, Belgium, France and Germany, wooden shoes (known as «sabots») and leather shoes with wooden soles are worn largely by laborers — both men and women — a form of footwear ideally adapted for wearing in dairies and other damp places. They are even beginning to be manufactured in large quantities in the United States for domestic use. In parts of Spain are worn sandals, slippers and shoes made of «esparto» grass (*Stipa tenacissima*), light in weight and enduring for a generation or more. However, throughout Europe and America, the machine-made boot and shoe have supplanted all others, with a resulting standardization of styles, a reduction in prices and a comfortable and relatively durable product.

Shoemaking has been called «the gentle craft.» Its patron saint is Saint Crispin, one of the early Christian martyrs, whose day on the Church calendar is 25 October, the anniversary of his excommunication. Crispin and his brother Crispianus were of noble Roman lineage. Due to persecutions during the reign of Diocletian they fled into Gaul, settling at Augusta Suessionum (now Soissons, France), where they followed the trade of shoemaking, at the same time spreading word of Christianity and doing deeds of benevolence. It is said that these brothers stole leather to make shoes for the poor. About the year 300 A.D., they were martyred by being beheaded. In the processions of the mediæval guilds, the shoemakers' patron — master of ceremonies — was known as King Crispin. From this word comes the adjective «crispin,» as applied to the shoemaking trade.

In America the introduction of shoemaking was coincident with the earliest settlement of the colonies. Among the party that came to Plymouth on the *Mayflower* was a shoemaker — Thomas Beard — provided with supplies and materials for supplying the little band of Pilgrims with shoes. Accredited to the governor of the colony, he was allowed a salary of $50 per annum and given 50 acres of land. A few years later — in 1636 — Philip Kerkland began the manufacture of shoes and boots at Lynn, which city has since been interested largely in the industry — at first supplying the needs of Boston and neighboring towns and later those of the entire colony. Other colonies each had their individual shoemaking industries, but from the start New England led. During the Revolutionary War Massachusetts manufactured the greater proportion of all ready-made shoes for the 13 colonies and those used by the Continental army, it being recorded that these latter were «for quality and price . . . quite as good as those imported from England.» Following the Revolution there were heavy importations from England, which hurt the domestic industry. The increasing home demand, however, soon overcame this and the industry, already established, proved its right to continue and grow. In 1795, 300,000 pairs of women's shoes — the labor of 200 master workmen and 600 journeymen — were manufactured in Lynn. So rapid was the growth at this period that certain makers, particularly in Lynn, Braintree and Reading — all in the State of Massachusetts — supplied only the wholesale trade. Boots and shoes were shipped to Boston, New York, Philadelphia, Charleston and Savannah and even to the West Indies. An important branch of the trade was the making of heavy «brogans» — a specialty at Milford and other Worcester County towns — for the use of the slaves of the Southern States. The supremacy of the New England product was unquestioned. There was very little variety in the leathers used — all being subjected to the slow tanning process. For uppers, pebble-finished goat leather was the most popular, later developed into the «brush kid» finish, the forerunner of the «vici» finish of to-day. Shoes intended for hard service were always pegged or nailed and frequently hobnailed. Those intended for the better trade were hand welted and shoes for women and children were mostly «turned» bottom. The straight, «rocker-bottom» last — ensuring at that time the maximum of comfort — was the prevailing style, the only concession to fashion (in women's shoes) seemingly being the variety of materials used for tops, comprising serges, plain and brocaded, and other cloths.

Machines.— Despite the successful attempt to establish the ready-made shoe and boot trade, it is well within the memory of those living that the village or itinerant shoemaker — making the shoes of entire families — was an important factor in the production of footwear. Except the making of high grade custom work, or in the repair (cobbling) of boots and shoes, the shoemaker is today supplanted by machine methods. The earliest machine-made shoe was that made on the machine invented in England in 1810 by Isambard M. Brunel. It mechanically nailed or tacked the sole to the upper fitted over a last, the nails being clinched. By this method 100 pairs of «strong and well-finished» shoes — at a contract price of 6s. 6d. ($1.56) — were made per day. At the time great hopes were entertained at the success of this method, but in shoes made by it for the English soldiers it was found that the nails penetrated through the sole into the foot. In 1818 Joseph Walker of Massachusetts invented the wooden shoe-peg machine, where individual pegs of wood were substituted for the metal nails used previously. From this has been developed a variety of pegging machines — some using the individual wooden pegs, and others using long strips of wood or metal, cutting the same into suitable lengths and driving them into the sole automatically. Two forms of these — «pegged» and «screwed» are used to-day for heavy, cheap boots and shoes. These improvements — developed one at a time — made it possible for one or several of the operations to be completed quicker than the others, resulting in a division of labor. It was at first the custom to send out the various parts to be cut and joined and later assembled at a factory on the automatic machines. With the growth of manufacturing plants, it was found more expedient to have all operations finished at the factory, which system has, in turn, again changed somewhat in the direction of specialty houses producing the individual parts of a shoe, the ultimate manufacturer merely assembling them in the finished product.

The great stride in the manufacture of shoes was that resulting from the invention in 1857 of the McKay stitching machine — a slow operation as previously done by hand. Introduced into active use in 1861–62, it was an important factor in supplying the Union troops during the Civil War. This method, which is in use to-day — see statistics at end of this article — and which for some purposes is preferred over all others, makes possible the automatic sewing of the outer-sole to the inner-sole — the edges of the upper being between the two — with a strong chain stitch, a furrow or channel being cut in the outsole to protect the part of the thread extending to the bottom. Its principal inconvenience is the fact that the threads extend through the insole, making a perceptible ridge which must be covered with a «sock» lining, a thin piece of leather or cloth covering the insole. Other machines for effecting separate operations were invented at about the same time or subsequently. The leather rolling machine was introduced about 1845, for pressing the leather and giving it the proper consistency, an operation formerly laboriously effected on the lapstone. Following this came the various types of leather sewing machines for stitching the uppers, using wax thread. In 1855 the automatic splitting machine was first used — for dividing leather or reducing it to a uniform thickness — following which came the «dieing-out» machine for cutting the soles and various other parts of the shoe by pressure on a fixed pattern. Improvements were made in pegging and nailing machines, particularly in the feeding of a continuous cable, cutting the same off at required lengths. The most important of these is the one used to-day, known as the «rapid standard screw machine.» Devices were perfected for making the individual lifts of the heels, assembling and nailing them together and on the corresponding part of the sole and finishing the whole. Other machines have been perfected for practically every operation in the making of footwear, one large factory of the United States producing machinery adapted to 170 distinct operations on a single pair of shoes, 210 pairs of hands being required. The greatest advance, however, from the standpoint of shoe-comfort, has been the so-called «Goodyear welt sewing machine,» which, with the manifold improvements of form introduced by last manufacturers, has produced a shoe with a perfectly smooth interior adapted to feet with irregularities. At the present time there are seven methods of attaching the outer sole to a shoe by machinery: (1) McKay stitching; (2) Goodyear welt stitching; (3) turn shoes (sewrounds — the sole sewed to the upper outside in and then turned), McKay machine used; (4) pegging with wooden pegs; (5) «standard screw»; (6) nailed, with inside clinching; and (7) welt attached to upper, sewed direct to edge of outsole by Goodyear stitch.

Leather.— In the making of footwear an important consideration is the kind and quality of leather, depending more or less upon the methods of tanning and finishing adapted to specified requirements. Flexibility, tensile strength and the possibility of absorbing moisture are the most important elements. Upon these depend the qualities of wear and comfort — in a word, the reputation of the manufacturer. Of all sole-leathers ox-hide is undeniably the best, followed by pig-skin, camel-hides and horse-hides. Likewise, for the uppers of heavy shoes calfskin is the standard, while for light shoes goatskin has the preference, closely followed by sheepskin. The term «hides» is applied to the larger full-grown animals of the bovine group, and to horses and camels, while «kips» is the term used with relation to the skins of the smaller animals, some of which belong also to the bovine class. In addition to the foregoing the skins of the kangaroo and many other animals, and even fish, have been utilized. Of the latter, the porpoise and shark seem most suitable, and the United States government is at present making a series of experiments with a view of utilizing shark-skins on a large scale. Lately efforts have been successfully made to use composition soles — of rubber mixed with a large proportion of fibre — and for uppers, canvas and other cloths have been found a suitable substitute for leather.

Processes of Manufacture.— The operations of the Goodyear welt process of shoemaking are substantially as follows: On the receipt of each order, the specifications are entered in the corresponding order book and given a number. Tags, one for each case of shoes, bearing the same number, with details, are sent to the foreman of the cutting room; others to the sole room, and a third lot to the «bottoming,» or assembling, room. The foreman of the cutting room selects and has the material for the uppers cut to the required measurements. This cutting to size is done by steel dies under heavy pressure on what is known as a «clicking» machine. In addition to cutting, they also mark the leather as a guide for assembling. The next operation is that of «skiving,» or beveling the edges, after which they are coated with cement and folded on a «folding» machine. For ornamental purposes, perforations are generally required — particularly on the tips, or toe-caps, and on the upper stitching edge of the vamp. This is done respectively with an automatic «tip punching» or «perforating» machine. Either is capable of making these perforations in the form of designs, the latter being similar in operation to a sewing machine. In the meantime, the linings of cloth or leather, having been cut according to instructions and stamped with order number, are given, along with the other, outer parts of the upper, to the stitchers, who, on sewing machines specially adapted to the purpose, sew the whole upper together. For laced shoes the next operation is the placing of the eyelets, on an automatic «eyeletting» machine, both sides mathematically correct at the same time. These «eyelets» are of metal, with smooth, flanged top and a diminutive «barrel,» which, during the operation, becomes clinched on the inner side of the shoe. This operation finished, the upper, completed, is sent to the «bottoming,» or assembling room, to be joined with the remaining parts of the shoe. In the meantime, in the sole room the outsole and the insole are roughly «died out,» an operation similar to the «clicking,» or cutting, of the parts of the upper; then trimmed to exact size on a «rounding» machine to the pattern of the sole. The outsole is then passed under heavy pressure through the «rolling» machine, the fibres being compressed and the leather being made capable of greater wear. This is the old operation indifferently done on the shoemaker's lapstone by beating the leather. It is then put through a «splitting» machine, for the sake of uniformity of thickness. The unit of measure is an «iron»— 48 «irons» being equal to 1 inch. The insole is treated in like manner, in addition to which, near the edge of what will be its eventual lower side, a slit of about one-half inch, extending toward its centre, is cut by a «channelling» machine. At the base of the resulting «lip,» or flap, and nearer the centre of the insole a groove is cut during the same operation. As will be seen later, the groove and slit are for the purpose of accommodating the stitching operation uniting the insole, upper and outsole. The «lip» is now forced at right angles to the insole by a «lip turning» machine, for the purpose of forming a lip, or shoulder, against which the welt is to be sewed, the groove on the inner side serving as a guide for sewing. During these operations the heel has been assembled in another part of the sole room, the different pieces of leather, or «lifts,» being cemented together and subjected to great pressure. The «counters» and «toe boxes,» respectively the stiffeners for the shoe «quarter»— the part of the upper at the back and sides of the heel — and for the toe cap, are also made ready in the sole room. With the completion of all these, they are sent to the «bottoming,» or assembling room.

In the bottoming room, the first operation is the automatic lacing of the upper (stitched together and eyeletted) on a «lacing» machine. This ensures the proper positioning of the upper upon the last with relation to the sole. The «counter» and the «toe box» are then properly positioned upon the last, over which the upper is then drawn. On the «last»—the wooden form corresponding to the shape of the foot — there has already been attached the insole—automatically secured by an «insole tacking» machine — in proper position. The upper being drawn over the last and attached to the insole, the operator verifies the position of the heel seam, on which depends the proper balance of the remaining parts. An «assembling» machine then drives two tacks part way through the upper into the last, on which another operator, on the «pulling-over» machine, with automatic pincers that grasp the «bottom» edges of the upper of the shoe at different points, and, pulling the edges with firm and uniform tension, press the leather of the upper against the last, through other movements adjusts the upper as desired. Another movement, with the pincers again pulling inward, and three tacks are partly driven in at each side and one at the toe, the upper being now in the proper position with relation to the insole. The next operation is by the «lasting» machine, the edges of the upper being automatically drawn by small pincers into their ultimate position on the last, each portion, as pulled into place, being automatically tacked part way — the operation being effected so uniformly that every shoe of each order number is the same. To properly last the toe and heel, a «wiping» motion is imparted to these parts, smoothing and securing the wrinkles resulting from the surplus stock. The tacks driven through the heel part are permanently clinched on the insole against the iron heel of the last, the remaining tacks being driven in only partly, in order to be again removed. An «upper trimming» machine trims off the surplus leather at the toe and heel, after the «wiping» operation, the remainder being pounded smoothly upon the last, the leather at the sides and around the «toe box» and «counter» being made to conform to the last. A «tack pulling and resetting» machine now pulls the lasting tacks, driving in others as necessary, or supplying other means for holding the edges of the upper flush with the insole edge and bent at right angles to conform with the «channel lip,» or shoulder as previously described for the insole. The «welt» is next attached. This is a narrow strip of leather extending from side to side of the heel around the toe between the upper and the outsole, its outer edge being flush with the latter, the two being apparently one piece. By means of an ingenious device known as the «welt sewing» machine the welt, positioned with its inner edge flush to the angle of the «upper» edge against the «channel lip,» just described, is stitched securely to the upper and the insole. This is effected by means of a curved needle adapted to making a stitch extending from the «groove» of the insole, through the «channel lip,» the «upper,» and diagonally through the inner edge of the «welt,» by a single motion, securing all three together. The upper securing tacks and those holding the insole to the last being withdrawn, the protruding portions of the welt, upper and channel lip, left after the welt sewing operation, are trimmed away, and the welt is hammered in a «welt beating and slashing machine» to cause it to stand out evenly from the shoe, special attention being required for the toe part to overcome the tension. A rubber cement is then applied to the face of the insole and welt, a «filling,» of leather, cork or other material, having been provided to occupy the horizontal space from side to side between the perpendicular «channel lips,» and in turn likewise coated with cement. The character of this «filling» is sometimes a determining factor in shoe quality. Leather scraps, if used, are apt, through their friction, to produce «squeaking» in walking, for which reason other materials devoid of this fault are preferred. A metal, or other «shank support» is also laid on the shank part of the insole, corresponding to the arch of the foot. At the same time, the outsole, trimmed to correspond with the last and welt, is also coated with rubber cement on the flesh side of the leather, and in the «sole laying» machine — in a rubber form, pressing every portion of the outsole surface — the upper and sole are brought together under heavy pressure until the cement sets. This finished, the sole — now consisting of the outsole and the welt, cemented together — is «rounded» and «channelled» on a machine performing these two operations. Rounding consists in trimming the sole to width required, and thinning same — for example, the edges of the «shank.» «Channelling» is the same operation as noted in the preparation of the insole — a diagonal slit near the edge of the «face» side of the outsole, the «channel,» being on a line with the stitching desired, which latter when completed is covered from sight and wear by the «channel lip» cemented back in place. Rounding and channelling have to do only with that part of the outside covered by the welt, the «heel seat» being untouched. This is followed by the sewing of the outside to the welt, the «channel lip,» before noticed, being turned out for the purpose. The stitches — with waxed thread — are extremely fine and durable, being known as the «lock-stitch.» The thread used is cotton or linen, the former for footwear liable to exposure to dampness. Due to lack of uniformity in the fibres, hemp, the favorite thread for custom-made shoes, cannot be used successfully on stitching machines. The «channel lip» is then cemented in its original position; the sole is then «levelled» under heavy pressure, to remove any unevenness on its bottom.

The heel — the «lifts» having been cemented together in the sole leather room — is positioned on the «heel seat» and the required number of nails are automatically driven through it, the «heel seat,» and the insole, the points being turned back into the heel where they are clinched. The heads of the nails are left protruding to accommodate the «face,» or toplift, which is put on last. Special care is made in the selection and preparation of the «face» on account of the wear to which it is subjected, brass or other «slugs» being generally inserted on its edges. The heel is then trimmed, the «breast»— the front face — is squared across or hollowed out, and the whole is scoured with sandpaper moulded to shape. The edge of the sole receives its final trimming and a coat of blacking, while the upper side of the welt is indented with little notches to indicate the stitches and then burnished, along with the edge of the sole. The succeeding operations all relate to the finish of the shoe, and, while varied, are not peculiar other than that most of them are performed by machinery — «buffing,» the polishing off of discolorations resulting from handling, «cleaning,» «blacking,» «polishing,» «creasing» — across the toe part, to take the place of irregular lines that might result from wear — stamping of name or trade mark, etc.

It will be noticed that the «last,» on which the upper is fitted, and on which it is retained throughout the making is an important element. It is the basis of style and fit, intended, as it is, to represent as nearly as possible the foot for which the shoe is ultimately intended. Their making is a distinctive profession, being known to the ancients, mention being made of lasts by the Greek authors. It is only within the period of machine-made footwear, however, that they have attained to anything near perfection. Due to their general similarity today, based upon the anatomy of the foot (q.v.), certain standards have been evolved giving commercial sizes in length and width (or rather girth) of the foot. There are three general systems of measurement — the English, used in the British dominions and by many manufacturers of the United States; the American, used only in the United States; and the French, used generally throughout Europe and metric system-using countries. The measurements comprise both length and girth of the foot — length from the heel, at the beginning of the tendon of Achilles, to the tip of the great toe, and girth, around the foot at the ball in a line at right angles to the direction of the second toe. For custom-made work measurements are taken around the foot — from the instep — under the arch, to the point of the heel, and horizontally around the ankle. With machine-made footwear these latter, while considered by the last-maker and manufacturer, are treated by the retailer and customer as a matter of comfort or style. The French unit of length is the «Paris point,» equaling ⅔ of a centimeter, or approximately 4/15 of an inch, 15 «points,» or sizes, being about 4 inches. The English and American measure is ⅓ inch, the former counted from the 4-inch mark of a standard rule, while the latter is counted from the 3-11/12 inch mark. At the annual meeting of the National Boot and Shoe Manufacturers' Association held at New York on 15–16 Jan. 1918, it was recommended that the English system of numbering for length be used entirely; that being generally known and having low numbers, had a more genteel sound, particularly for women's shoes. Taking the English measure, the sizes run from 1 to 13, for children and youths, and, for adults, continue in a new series from size 1 on. A youth's size 13 is therefore 4 plus (13x⅓) inches, or 8⅓ inches long, while an adult's size 5 — in the second series — is 4 plus [(13 plus 5)x⅓] inches, or 10 inches long. Breadth (or girth) — known as «the last» — is indicated in the English system by numerals, the standard average being 3; the American system, used in the United States, being that of letters, the standard average being C (the equivalent of the English «3»), the smaller widths being B, A, AA and AAA, and the larger D, E, EE and EEE (or W), the triple lasts being extremes. The standard of difference between each «last» letter and its next in order is ¼ inch, for the same length of shoe; and between the same last letter of two shoes one size apart is ¼ inch, and for ½ size apart, ⅛ inch. From these gradations it is possible, a specified size and last being known, to figure out any other. The standard model for men's wear is size 7, last C; that of women, size 4, last B. Size 7 indicates a length of 10⅔ inches, and the girth of its C last is 8½ inches; size 4 and its last B, are respectively 9⅔ and 7½ inches. From this, it will be noted that the «last» is almost exactly 8/10 of the length of the «size.» The rule for measuring is to measure the length of the foot, adding — for play of shoe — 1/12 inch for each inch or major fractional part thereof, the result being the length of the shoe, or «size.» This figure, multiplied by .8 (the ratio of the girth at the ball of the foot) gives the «last,» in inches. From these two figures, by the application of the rule for measurement by the English system, and by the rule for the determination of «last» differences, the size and «last» required may be found. Example: The length measurement of a given foot is 10 inches; girth at ball, 8⅜ inches. The length, 10, plus 10/12 inch, equals 10 10/12 inches — the «size» — which, multiplied by .8 (the girth ratio for the C last) gives 8.66 inches, say 8⅝. Ten and ten-twelfths inches in length, English system, indicates a size of 7½, the C, or standard last of which is 8⅝ inches. The actual girth measurement, 8⅜ inches, being ¼ inch less, a unit representing one «last» letter, is to be subtracted from «last» C, indicating «last» B — the width required for size 7½.

The Industry.— As an industry, the manufacture of footwear is important. Of the manufactures of the United States considered in the tabulations of the statistics of 1914 — 344 in all — boot and shoe manufacturing, including cut stock and findings, ranked sixth in number of wage earners and ninth with regard to gross value of products. It is a distinctively American industry, due to the pre-eminence of American inventions, methods and machinery. So evident is this fact, that imports of footwear since 1870 have been almost negligible. On the other hand, shoes made in the United States have found a market in every land, their excellence being a standard of durability and style. New England, particularly Massachusetts, is (1914) the chief manufacturing centre of the United States, followed by New York, Missouri, Pennsylvania, Ohio, Wisconsin, Illinois, New Jersey, Minnesota and Michigan. The following table gives the leading statistics of the industry for 1899, 1909 and 1914, in the United States:

	1899	1909	1914
Number of establishments....	2,253	1,918	1,960
Capital........	$110,363,000	$222,324,000	$297,609,000
Cost of materials	$191,456,000	$332,738,000	$382,111,000
Value of products.........	$290,047,000	$512,798,000	$590,028,000
Salaried employees..........	8,348	15,788	19,815
Salaries........	$8,159,000	$18,629,000	$25,473,000
Wage earners (average number).........	151,231	198,297	206,088
Wages.........	$61,924,000	$98,463,000	$112,973,000
Proprietors (number)....	(Not given)	1,838	1,702

As to the number of pairs manufactured, the government statistics of the census of 1910 and the *Shoe and Leather Reporter* of 27 Sept. 1917, give the following figures:

Kind	1899	1909	1914
Boots and shoes (total)........	195,589,173	247,643,197	252,516,603
Men's..........	67,742,839	93,888,892	98,031,144
Boys' and youths'	21,030,479	23,838,626	22,895,719
Women's.......	64,972,653	86,595,314	80,916,239
Misses and children..........	41,843,202	43,320,365	48,322,395
Fiber...........	....	....	2,351,106
Slippers (total)....	17,092,841	17,507,838	17,733,689
Men's, boys' and youths'.......	4,446,965	4,802,841	3,666,972
Women's, misses' and children's.	12,645,876	12,704,993	14,066,717
Infants' shoes and slippers (total).	(Not reported separately)	15,000,721	15,476,763
All other..........	5,283,405	4,865,429	6,939,413

Of the total number manufactured in 1909, 43.2 per cent were of the McKay type, 35.3 per cent machine or hand welted, 10.6 per cent turned, 8.8 per cent wire-screwed or metal-fastened, and 2.1 per cent wooden-pegged.

Since 1914 there is estimated to have been an increase of about 25 per cent in the production of footwear over that of 1914, with a slight increase in the number of manufacturing plants — principally in the Middle West. Due to abnormal conditions resulting from the war many changes have been made in the industry and others are under consideration — chiefly with a view to uniformity and standardization. In 1914 the domestic per capita consumption of men's shoes was 2.9 pairs, as against an estimated consumption of 2.6 pairs for 1918; women's, 1914, 2.6 pairs, 1918 estimated, 4 pairs. The increase in the latter has been ascribed in part to the short skirts that women are wearing, necessitating greater attention to shoe style. The relative decrease indicated for men is more than overcome by the shoe requirements for the army, contracts for 21,000,000 pairs for the latter being placed by the United States government during the year 1917. Of these, 8,000,000 pairs are marching shoes, 11,000,000 pairs field or trench shoes and 2,000,000 pairs naval or marine shoes. The contracts were apportioned to over 50 different shoe factories, located in different parts of the country, the price ranging from $4.33 to $5.84 — the average being about $4.90. All shoes must be of the Goodyear welt type, and conform to the «Munson» last, supplied to the makers by the government. In addition, the contracts from foreign countries were large.

The exports of boots, shoes and slippers amounted in 1906 to 5,672,249 pairs, valued at

$9,142,748; 1912, 9,040,343 pairs, valued at $16,009,002; and 1916, 20,557,785 pairs valued at $47,454,846 — the separate classes in 1916 being as follows:

Exports of boots, shoes and slippers, 1916	Pairs	Value
Children's....................	2,722,209	$2,224,791
Men's....................	12,800,183	36,959,966
Women's....................	4,836,080	8,040,053
Slippers....................	199,313	230,037

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W. B. Graham.

BOOTT, Francis, American musician and composer: b. Boston, Mass., 1813; d. 1904. He issued his first compositions under the name of Telford. His works comprise a mass for voices and instruments, a Miserere, Te Deum, Maria Mater and numerous songs including ‘The Sands of Dee,’ a setting of Kingsley's poem. He was an honorary professor of the Academy of Fine Arts and bequeathed to Harvard University $10,000 as a prize fund for compositions by native composers.

BOPP, Franz, German philologist: b. Mainz, Germany, 14 Sept. 1791; d. Berlin, 23 Oct. 1867. He has been called «the founder of comparative philology,» and it seems wholly true, as was said at the time of his death, that, but for him, the science of language might not have elevated itself so soon or so indisputably to a height deserving the title of science. A distinguished English scholar who had studied under Bopp showed in the following tribute how deeply the merit of his old instructor was appreciated: «Bopp must, more or less, directly or indirectly, be the teacher of all who at the present day study, not this language or that language, but language itself — study it either as a universal function of man, subjected, like his other mental or physical functions, to law and order, or else as an historical development, worked out by a never ceasing course of education from one form into another.» (Consult Martineau, R., ‘Obituary of Franz Bopp,’ in *Transactions of the Philological Society,* London 1867, pp. 305–14). He received the higher portions of his education at Aschaffenburg, devoting himself specially to the study of the languages of the East because correct reasoning made it clear that, if anything was to be discovered respecting the relations of languages and races, investigation of the oldest accessible forms of speech offered the best prospect of success. At Aschaffenburg his instructor was Windischmann, but to study Sanskrit Bopp went to Paris in 1812. There he spent five years of laborious study, almost living in the libraries of Paris and unmoved by the turmoils that agitated all the world around him, comprising Napoleon's escape, the Waterloo campaign and the Restoration. Antoine Léonard de Chezy was his chief instructor then. In 1816 he had made sufficient progress to publish a treatise ‘On the System of Conjugation in Sanskrit, compared with the Greek, Latin, Persian and German Languages,’ which is particularly interesting because it shows the early adoption of the essential principles that were fully worked out much later in his famous ‘Comparative Grammar.’ For some time in 1817 he resided in London and used the libraries there; in 1818 he went to Göttingen and continued his studies in the library of its university; and he received, in 1821, his appointment as professor of Oriental literature and general philology at the University of Berlin. He held this post till death. Estimating, and with intimate acquaintance appreciating, his former teacher's achievements, Russell Martineau wrote: «Bopp's Sanskrit studies and Sanskrit publications are the solid foundations upon which his system of comparative grammar was erected, and without which that could not have been perfect. For that purpose, far more than a mere dictionary knowledge of Sanskrit was required. The resemblances which he detected between Sanskrit and the Western cognate tongues existed in the syntax, the combination of words in the sentence and the various devices which only actual reading of the literature could disclose, far more than in the mere vocabulary. As a comparative grammarian he was much more than as a Sanskrit scholar,» and yet «it is surely much that he made the grammar, formerly a maze of Indian subtilty, as simple and attractive as that of Greek or Latin, introduced the study of the easier works of Sanskrit literature and trained (personally or by his books) pupils who could advance far higher, invade even the most intricate parts of the literature and make the Vedas intelligible. The great truth which his ‘Comparative Grammar’ established was that of the mutual relations of the connected languages. Affinities had before him been observed between Latin and German, between German and Slavonic, etc., yet all attempts to prove one the parent of the other had been found preposterous.» Fortunately we have Bopp's own opinion on this subject, expressed in his own words; for in an English essay he declared his views as follows: «I do not believe the Greek, Latin and other European languages are to be considered as derived from the Sanskrit in the state in which we find it in Indian books; I feel rather inclined to consider them altogether (obviously meaning all together) as subsequent variations of one original tongue, which, however, the Sanskrit has preserved more perfect than its kindred dialects.» Appended to the cited paper in the ‹Transactions› is a list of the writings of Professor Bopp, the titles grouped as 21 main items with 11 entries of later editions or translations. We mention a few representative works: Bopp, F., ‹Ausführliches Lehrgebäude der Sanskrit-Sprache› (Berlin 1827); ‹Comparative Grammar of the Sanskrit, Zend, Greek, Latin, Lithuanian, Gothic, German and Slavonic Languages,› translated by E. B. Eastwick (2d ed., London 1856); ‹Über das Conjugationsystem in Vergleichung,› etc. (Frankfurt-a-M. 1816); ‹Über die Verwandtschaft der Malayisch-Polynesischen Sprachen mit den Indisch-Europäischen› (Berlin 1841); ‹Vergleichendes Accentuations-system des Sanskriti und Griechischen› (Berlin 1854); and ‹Vergleichende Zergliederung des Sanskrits und der mit ihm verwandten Sprachen› (Berlin 1824). On the 50th anniversary of the publication of his first work, his colleagues and scholars founded the Bopp Foundation in Berlin (1866) to promote the study of comparative philology.

BORA, Katharina von, wife of Luther: b. Klein-Laussig, near Bitterfeldt, Saxony, 29 Jan. 1499; d. 20 Dec. 1552. She took the veil very early in the nunnery of Nimptschen, near Grimma; but becoming imbued with Reformation doctrines, and feeling very unhappy in her situation, she applied, with eight other nuns, to Luther, whose fame had reached them. Luther gained over a citizen of Torgau, by the name of Leonard Koppe, who, in union with some other citizens, undertook to deliver the nine nuns from their convent. This was done the night after Good Friday, 4 April 1523. Luther brought them to Torgau and from thence to Wittenberg. At the same time, to anticipate the charges of his enemies, he published a letter to Koppe, in which he frankly confessed that he was the author of this enterprise and had persuaded Koppe to its execution; and he also exhorted the parents and relations of the virgins to admit them again into their houses, who, however, declined to receive them. Some of them were received by citizens of Wittenberg; others who were not yet too old Luther advised to marry. Among the latter was Katharina, whom Philip Reichenbach, at that time mayor of the city, had taken into his house. Luther proposed to her several of his friends. She declined these proposals, but declared her willingness to bestow her hand on Nicholas von Amsdorf, or on Luther himself. Luther, who in 1524 had laid aside the cowl, was not averse to matrimony, yet appears to have been led to the resolution of marrying by reason rather than by passion. His marriage (13 June 1525) gave rise to many disadvantageous rumors, some of them as shameful as they were unfounded. Three sons and three daughters were born of the union. After Luther's death Katharina removed from Wittenberg to Leipzig, where she was compelled to take boarders for her support. She afterward returned to Wittenberg and finally removed to Torgau, where she died. In the church of Torgau her tombstone is still to be seen, on which is a life-size image of her. Consult ‹Lives› by Hofmann (1845); Kroken (1900); Stein (1879); and Thoma (1900).

BORACIC (-ras'-) **ACID,** or **BORIC ACID** (from «borax»), a compound of boron with oxygen and hydrogen, having the formula H_3BO_3, and possessing feebly acid properties. It occurs free in nature in an impure state in the crater of Vulcano, one of the Lipari islands, and in the crater of Stromboli. It is also found plentifully in Tuscany, where it issues from fissures in the soil, together with sulphurous exhalations, ammonia and other substances. On account of its having been obtained at Sasso, the acid is called by mineralogists Sassolite. In the United States the fumes of boracic acid are found in emanations from fissures in Nevada and California. They are also found in Nova Scotia. In South America at many localities along the western coasts boracic acid occurs in immense quantities as boronatrocalcite, particularly in the great lagoons covering 2,000,000 acres near Maricunga. Concentrates of this deposit are being regularly shipped to England. The principal supply of boracic acid is obtained from Tuscany, the exhalations above referred to being passed through water which absorbs the acid. The preparation of boracic acid from these aqueous solutions is an interesting process on account of the natural obstacles which have to be surmounted. The apparently simple operation of concentrating the solution, so as to obtain the acid by crystallization, in reality involves great practical difficulties, because in Tuscany the fuel supply is limited. This drawback has been overcome by utilizing the volcanic heat of the district to concentrate the solution. Around the cracks in the soil (called «fumaroles» or «soffioni»), from which the steam containing the acid issues, and enclosing the small lakes or lagoons in which it condenses, brick tanks are built on different levels, but communicating with each other. These are supplied with cold water, in which the steam is further condensed. When the water in the tanks is sufficiently saturated, it is run off into a deep vessel, where it is allowed to stand until the black mud mechanically suspended in it falls to the bottom, and then the clear fluid is run into a series of shallow evaporating pans of lead. These pans are heated by steam from the soffioni, the steam being made to pass under them by a system of flues. As the evaporation proceeds the fluid becomes richer in boracic acid, and when it attains a certain specific gravity, it is passed into a deep vat, where it is allowed to cool. Boracic acid then crystallizes out. The first crop of crystals is quite impure, but it is improved by re-crystallization, and the second crop as thus obtained is packed in casks and exported. Commercial boracic acid sometimes contains as much as 25 per cent of foreign matter, consisting largely of clay, salts of calcium and magnesium, and sulphates and other salts of the alkalis. About 2,000 tons of crude boracic acid are exported from Tuscany per annum. The South American product, containing 55 to 60 per cent of pure boracic acid, has become a serious competitor of the Italian product in the markets of Europe. In the American market California's large production of colemanite (calcium borate) is an important factor. Persia has also recently become a source of boracic acid of excellent quality. Boracic acid is also prepared artificially by decomposing a hot solution of borax with sulphuric acid. The proportions are three parts of borax in 12 parts of hot water, and one part of sulphuric acid. The boracic acid separates out upon cooling. Boracic acid is a white, lustrous substance, of soapy feel, slightly soluble in cold water and considerably more soluble in hot water. It possesses strong antiseptic properties, and is used as a preservative for meat. It is also used for glazing porcelain, and in the manufacture of certain kinds of glass. Boracic acid forms salts called «borates» with various metallic bases, of which borax is the most important. See BORON.

In medicine, boracic acid is used very widely. It is a mild antiseptic, and its solutions are useful for cleansing the eyes, nose, mouth, bladder, etc. It forms with aromatic oils the basis of most mouth washes and nasal sprays. Boracic acid is also very useful in the nursery for keeping rubber nipples free from bacteria, and it is of great service in washing out nursing-bottles, babies' mouths and eyes, and the mother's nipples while nursing. Large doses, however, may prove poisonous.

BORACITE (from «borax»), a mineral, tetrahedral and isometric in external form, but orthorhombic in molecular structure, and becoming isotropic only when heated to 510° F. It closely resembles a fine-grained white marble. It has the composition $6MgO.MgCl_2.8B_2O_3$, and a little iron is also occasionally present, probably as an impurity. It occurs in beds of anhydrite, gypsum and salt, notably at Stassfurt, Prussia, also in crystals at Lüneberg, Hanover and Westeregeln, Saxony. The most extensive commercial workings of boracite are in Asia Minor, near the Tschataldga Mountains. The deposit occurs in a basin of the Tertiary Age. The colemanite of California is a variety of boracite. The mineral has been prepared artificially by melting together 10 parts of boracic acid, 100 of sodium chloride and 5 of magnesium borate. Boracite is strongly pyroelectric. Its molecular structure has been the subject of much study, on account of its exhibiting double refraction, although the mineral is apparently isometric in crystalline form.

BORAGE, bŭr'azh (*Borago*), a small genus of plants, typical of the family *Boraginaceæ*, the species of which are most numerous in the Mediterranean region. Common borage (*Borago officinalis*), a coarse growing annual herb, is about two feet tall with erect stem, rough hairy leaves, and blue flowers arranged in racemes. Like many other innocuous plants, borage was highly valued medicinally, but is now not so employed. It is occasionally raised in Europe as a pot herb or salad plant, its young leaves being palatable. The flowers are still used to make the beverage known as cool tankard, a mixture of wine, lemon, sugar and water. The plant's chief use, however, is as bee pasturage, its flowers being rich in nectar.

BORAH, bō'rä, **William Edgar**, American legislator: b. Fairfield, Ill., 29 June 1865. He studied at Southern Illinois Academy and the University of Kansas, and in 1889 began practice as lawyer at Lyons, Kan., two years later removing to Boise, Idaho. He was elected to the United States Senate for the term of 1907–13, and was a member of the Republican National Committee 1908–12. He was reelected United States senator for the term 1913–19. A forcible speaker, he has been prominent in opposition to the growth of imperialism, in the discussion of the income tax and other questions of national importance.

BORAS, boo-rōs', or räs', Sweden, town in the province of Elfsborg, 36 miles east of Gothenburg. It was founded by Gustavus Adolphus in 1632. There are some cotton and linen manufactures, and also some dye works. Pop. 21,997.

BORASSUS, a genus of palms, containing a single species (*B. flabellifer*) which is widely distributed in tropical Asia and Africa. The Borassus or Palmyra palm is one of the most important members of the palm family since it is of remarkably wide distribution, usually forming the most conspicuous feature of the vegetation of the regions in which it grows, and since it is of great economic importance. A poem in the Tamil language is said to enumerate 801 of its uses without exhausting the subject. The wood is useful and the leaves are employed for endless purposes; from the flower clusters palm wine is made, and the fruits and young seedlings are used as food. From the sap palm sugar is obtained, which is exported in large quantities to Europe.

BORAX, a compound of the metal sodium with boracic acid (q.v.). The formula of boracic acid may be written $HBO_2 + H_2O$; and if the hydrogen of the HBO_2 is replaced by sodium, a compound known as sodium borate is formed, which crystallizes as $NaBO_2 + 4H_2O$. Fused borax is this salt deprived of its water of crystallization, and combined with boron trioxide in the form $2NaBO_2 + B_2O_3$, or $Na_2B_4O_7$. Common borax, when crystallizing from aqueous solution, however, contains 10 molecules of water. Other forms of borax are easily obtained, crystallizing with different quantities of water. Borax occurs native, both as a saline efflorescence on the soil, and as monoclinic crystals. Until recent times the principal borax supply of the world was obtained from the salt lakes of Tibet. It was brought to Europe in the crude state, under the name of tincal. Enormous quantities of borax are now obtained from California and Nevada. Borax Lake, some 80 miles north of San Francisco, was discovered in 1856. It contains borax in solution, and crystals of the mineral also occur in the surrounding mud and marshes. The crystals are occasionally quite large, weighing as much as a pound each. It is also found in large quantities at Borax Lake in San Bernardino County, Cal., and it occurs abundantly as an efflorescence in Death Valley, Inyo County, Cal. Borax bearing clays are found in the beds of many extinct lakes of arid Western United States. They are believed to be residues from the evaporation of borax lakes. At other points borax is believed to be precipitated from hot gaseous volcanic emanations. The chief refining plants for borax are at Alameda and Searles, Cal., and in New Jersey. The crude material is dissolved in water and heated in conjunction with sodium carbonate. This solution is next placed in cooling tanks in which are suspended steel rods, on which the borax forms. For added degrees of purity successive crystallizations are employed until the desired degree is reached.

Different methods of refining are employed in various countries depending on the form of the crude material. Borax is extensively used in the household, and it is used also as an antiseptic and preservative. Like boracic acid, it is employed in glazing porcelain and in making enamels. Its property of dissolving metallic oxides makes it of great value in blowpipe analysis (q.v.) and as a flux in the soldering of metals. In the United States commercial borax is chiefly derived from the colemanite deposits of California. About 55,000 tons valued at $1,600,000 are produced annually in California. Chile is the second largest producer of borax, the ore being a sodium calcium borate.

Borax is of toxicological interest because it is widely used as an antiseptic, a preservative for meats and other foodstuffs, and also as an abortifacient. In large doses there is marked gastro-enteritis, in addition to which there are symptoms of collapse, coldness of the skin, bad pulse, psychical depression and diminution in the quantity of urine eliminated. Similar symptoms may occur from the use of borax in washing out large abscess cavities. Singultus and general motor paralysis are the symptoms in fatal cases. Borax certainly has a toxic action on the kidneys when taken in large amounts. There is albumen in the urine, casts, pain in urination, and even bloody urine. While the kidneys are markedly affected by large doses it is questionable whether borax, in the small amounts used in food preservation, causes any grave symptoms of kidney irritation, even when taken for a considerable length of time. It may well be that certain individuals have an idiosyncrasy to boron salts, in which case their use would prove detrimental. Consult ‘Mineral Resources of the United States’ (Washington, annually) and ‘Annual Bulletin No. 24, California State Mining Bureau.’ See BORGAN; MINERAL PRODUCTIONS OF THE UNITED STATES.

BORCHGREVINK, bôrн-grĕ-viṇk, **Carsten Egeberg**, Norwegian explorer and lecturer: b. Christiania 1864, his mother being English and his father a Scandinavian. He went to sea at an early age but returned to go to college. In 1888 he went to Australia, joined the survey department and scaled Mount Lindsay, and was for a time instructor in languages at Cooerwell College, New South Wales. In 1894–95 he was in Antarctic waters, a region more fully explored by him in 1897, when he attempted to reach the South Pole without success. In 1899 (17 February) he had, however, reached Robertson Bay. Returning to London in 1900, he reported having reached lat. 78.50 S., long. 165.50 E., the farthest point south ever reached by man. Antarctic fauna and flora were studied on the expedition and the south magnetic pole reported to be in lat. 73° 20′ S. and long. 146° E. Consult his work, ‘First on the Antarctic Continent.’

BORDA, Jean Charles, French engineer and afterward a captain in the French marine, famous for his mathematical talents: b. Dax, department of Landes, 4 May 1733; d. 20 Feb. 1799. In 1756 he was chosen a member of the Academy of Sciences and occupied himself in making experiments on the resistance of fluids, the velocity of motion and other topics relating to dynamical science. In 1767 he published a dissertation on hydraulic wheels and afterward one on the construction of hydraulic machinery. In 1771, with Verdun de la Crenne and Pingré, he made a voyage to America to determine the longitude and latitude of several coasts, isles and shoals, and to try the utility of several astronomical instruments. In 1774 he visited the Azores, the Cape Verde Islands and the coast of Africa for the same purpose. In the American war he was very useful to the Count d'Estaing by his knowledge of navigation. Borda was the founder of the schools of naval architecture in France. He invented an instrument, of a very small diameter, which measures angles with the greatest accuracy and which has been used in measuring the meridian; the reflecting circle, which has made his name immortal, besides an instrument for measuring the inclination of the compass-needle, and many others. On the establishment of the National Institute he became one of its members and was occupied with other men of science in framing the new system of weights and measures adopted in France under the republican government. Among the latest of his labors was a series of experiments to discover the length of a pendulum which should vibrate seconds in the latitude of Paris. His principal writings are ‘His Voyage’ and ‘Tables Trigonométriques Décimales.’

BORDEAUX, bôr′dō′, France, capital of the department of Gironde, is situated on the left bank of the Garonne, about 70 miles from the sea and 284 southwest of Paris. It is built in a crescent form round a bend of the river, which is lined with fine quays for more than three miles and is crossed by a magnificent stone bridge of 17 arches, finished in 1821 at a cost of $1,200,000. There is another bridge, a fine iron structure, for the railway from Paris. Bordeaux consists of an old and a new town, the boundary between them being formed by a wide and handsome street which, commencing at the quay near the centre of the crescent, stretches across the city from east to west. The objects chiefly deserving of notice in the old town are the arch called the Porte de Bourgogne at the extremity of the bridge, forming the principal entrance to the town; the cathedral, a fine Gothic edifice built at different periods; Saint Michael's Church, with a lofty detached tower and a superb front of florid Gothic; the church of Saint Croix, a specimen of gorgeous Romanesque; the bourse or exchange; the custom-house; the Hôtel de Ville, once the residence of the archbishops of Bordeaux, and the Palais de Justice. The new town is not so rich in public buildings. The most conspicuous are the library (200,000 volumes and 1,563 manuscripts, including one of Montaigne's ‘Essays’), the museum and the theatre, a Grecian structure, regarded as the handsomest edifice in Bordeaux. Among the beneficent establishments the first place is due to the grand hospital or infirmary, which occupies the highest site in the town and is admirably arranged. Few cities are so well supplied with extensive and finely-planted promenades. Bordeaux is the seat of a court of appeal, of courts of the first instance and of commerce, and has an academy of science, literature and art; a preparatory school of medicine and pharmacy;

a lyceum; a normal school for female teachers; a school of hydrography and navigation; a school of painting and design; a botanic garden, an observatory, various literary and scientific associations and a branch of the Bank of France. There are consuls resident here from all the states of Europe and America. The position of Bordeaux gives it admirable facilities for trade and enables it to rank next after Marseilles and Havre in respect of the tonnage employed. Large vessels can sail up to the town, which by railway, river and canal communicates with the Mediterranean, with Spain and with the manufacturing centres of France. The chief exports are wine and brandy; drugs, dyes, bottles and fruits are also largely exported. Sugar and other colonial produce and wood are the chief imports. Ship-building is the chief branch of industry and there are also sugar refineries, woolen and cotton mills, potteries, soap works, distilleries, cooperages and rope factories. The famed Bordeaux wines have a world-wide reputation and are exported in immense quantities. The best known are Château-Lafitte, Château-Latour, Haut-Brion, Barsac, Graves, Sauterne and Langon.

Bordeaux is the Burdigala of the Romans. In the 5th century it was in possession of the Goths, and it was pillaged and burned by the Normans. By the marriage of Eleonor, daughter of the last Duke of Aquitaine, to Louis VII, it fell into the hands of France. But in 1152 the Princess was repudiated by her husband and married to Henry of Anjou, who ascended the throne of England in 1154, as Henry II, and transferred Bordeaux to that crown. After the battle of Poitiers, Edward the Black Prince, carried John, King of France, prisoner to Bordeaux, where he resided 11 years. Under Charles VII, in 1451, it was restored again to France. In 1548 the citizens rebelled on account of a tax on salt, and the governor, De Morems, was put to death, for which the Constable of Montmorency inflicted a severe punishment on the city. During the Revolution it was devastated, as the rendezvous of the Girondists, by the Terrorists, almost as completely as Lyons and Marseilles. The oppressiveness of the continental system to the trade of Bordeaux made the inhabitants disaffected to the government of Napoleon, so that they were the first to declare for the house of Bourbon, 12 March 1814. In 1870 Bordeaux was the seat of the government of National Defense and in the following year the National Assembly met there for the first time. It is the birthplace of Rosa Bonheur. The Roman poet, Ausonius, was a native of Bordeaux. Montaigne and Montesquieu were born in the neighboring country, and the latter lies buried there in the church of Saint Bernard. Pop. about 265,000.

BORDEAUX, University of, French university, founded in 1441 at a time when Bordeaux was in English hands. Convent and cathedral schools and a school of medicine were combined to form a university. Louis XI confirmed its autonomous privileges, which it held until the reign of Francis I, who had it placed under state control. Faculties of science and letters were added in 1808 during the Napoleonic educational reforms. In 1870 a faculty of law and in 1878 a faculty of medicine and pharmacy were added. Its annual budget totals 300,000 francs; its student enrolment is about 2,500, of whom about 800 are in medicine and an equal number in law. The library contains about 10,000 volumes. The Marine Zoological Laboratory of Archachon is connected with the university.

BORDEAUX MIXTURE. See FUNGICIDES.

BORDEAUX WINES. The finer red wines of the country around Bordeaux are the best which France produces. They contain but little alcohol, keep well and even improve by removal. As the original fermentation is complete, they are, if judiciously managed, less subject to disorder and acidity than the Burgundy wines. None of the very best quality, however, is exported pure; a bottle of the best Château-Margaux or Haut-Brion is a rarity hardly to be procured in Bordeaux itself at the rate of six or seven francs a bottle. For export, the secondary growths of Médoc are mingled with the rough Palus. The red wines of Bordeaux are known in America under the name of claret. They have less aroma and spirit but more astringency than the Burgundy wines. They are the safest wines for daily use, as they are among the most perfect of the light wines and do not easily cause intoxication. In this respect they contrast with the Burgundy wines, which have more generous qualities than those of Bordeaux, although these wines have sometimes been accused of producing the gout, but this disparagement is without reason. Persons who habitually drink madeira, port, etc., and indulge in an excess of claret may indeed be visited in that way, because a transition from the strong, brandied wines to the lighter is always followed by a derangement of the digestive organs.

The principal vineyards are those of Médoc, Graves, Palus and Vignes Blanches; after these, those of Entre-deux-Mers, Saint Emilion and the Bourgeais are the most important. The first growth of Médoc are the famous wines of Château-Margaux, Lafitte and Latour. The Lafitte is characterized by its silky softness on the palate and a perfume partaking of violet and raspberry. The Latour is fuller, has more aroma but less softness. The Château-Margaux is lighter than the Latour and delicate like the Lafitte, but has not so high a flavor. Of the second growth we may mention the Rauran and the Léoville. The soil of Médoc is a sandy and calcareous loam. The gravelly lands (*les Graves*) to the south and west of Bordeaux produce the Graves. The first growth of the red Graves is the Haut-Brion, which rivals the first growth of Médoc; it has more color and body but is inferior in aroma and taste. The principal white Graves are Saint Bris and Carbonieux. The best Médoc ought to be kept three or four years before removal, the Graves five or six. The wines of Palus, which is a bed of rich alluvial deposits, are inferior to the preceding; they are stronger and more deeply colored than those of Médoc. Being hard and rough, they are improved by a voyage and are principally sent to the East Indies and America as *vins de cargaison,* or are mixed with Médoc which is intended for exportation. By the voyage they become more light and delicate but are not to be compared with the growths of Médoc and the Graves. The best are Queyries and Mont Ferrand. The former are deeply colored and have much body. Age gives them an agreeable aroma, resembling that of a raspberry.

Among the white Bordeaux wines, besides those already mentioned, the finest growths are Sauternes, Preignac, Barsac and Bommes. Martillac and Saint Médard are of a good quality and have lightness and body. Dariste, formerly Dulamon, is equal to Saint Bris and Carbonieux. Among other red wines are the Bourgeais, which are of a fine color and acquire by age lightness and an agreeable almond aroma; of all the Bordelais wines they most resemble the Burgundy wines. The first growths are Debosquet, Château-Rousset, Tajac and Falfax. The Bourgeais wines were formerly preferred to Médoc. The wines of Saint Emilion have been much esteemed. The Fronsac and Canon are the best. Those of Entre-deux-Mers become agreeable with age. The *vins des Côtes* are good *vins ordinaires;* they are generally *fermes* and hard, and improve by age. The best are those of Bassens and Cenon. Consult Henderson's 'History of Ancient and Modern Wines.'

BORDELUMIANS, a religious sect which had its origin at Bordelum (Sleswick) in 1739 under the leadership of David Baehr. The original score of persons composing the sect claimed to be «saints» who had received special gifts from God. They looked with contempt upon the sacrament and declared that the churches were the houses of the devil. They rejected marriage in favor of free-love and held property in common. By an edict of Christian VI (11 June 1739) the leaders were condemned to imprisonment, but they escaped by flight. Baehr fled to Jena, but, being driven out of there, he went to Holstein and was finally imprisoned at Glück. He died a cripple from his prison treatment in 1743.

BORDEN, Sir Frederick, Canadian Minister of Militia: b. Nova Scotia 1847; d. Toronto, 5 Jan. 1917. A medical man by profession, he took his degree at Harvard and became assistant surgeon in a militia battalion. In 1874 he entered the Dominion Parliament, representing King's County, N. S., till 1911. Appointed Minister of Militia in the Laurier cabinet in 1896, he held that office till 1911. Under his administration the expenditure for land defense increased five-fold, and the naval program had his zealous support. He was a member of the Imperial Council of Defense and assisted every movement toward co-operation between the Imperial and Canadian forces. In 1901 he was appointed honorary colonel of the Canadian Army Medical Corps.

BORDEN, Gail, American inventor: b. Norwich, N. Y., 6 Nov. 1801; d. Bordon, Tex., 11 Jan. 1874. His parents were of New England descent and in 1814 they emigrated from New York, settling in Covington, Ky., and later in Madison, then in the Territory of Indiana. In 1822, finding his health impaired, he removed to Mississippi, where he taught and also filled the positions of county surveyor and United States deputy surveyor. In 1829 he went to Texas. He was elected delegate to the convention that, in 1833, petitioned the Mexican government for separation, and he was also in charge of the official surveys of the colony, compiling the first topographical map of Texas. The land office at San Felipe was under his charge up to the time of the Mexican invasion. In 1835, with his brother, Thomas H., he established the *Telegraph and Texas Land Register* at San Felipe, which was afterward transferred to Houston, and was the first and only newspaper published in Texas during the war for the independence of that colony. After the establishment of the republic of Texas he was appointed by President Houston first collector of the port of Galveston. That city in 1837 had not been laid out and its first surveys were made by him. From 1839 to 1857 he was agent of the Galveston City Company, a corporation owning several thousand acres of land on which the city is now built. About 1849 his attention was drawn to the need of more suitable supplies for emigrants crossing the plains, and after some experimenting he produced the «pemmican» which Dr. Kane carried with him on his Arctic expedition. The «meat biscuit,» the most simple, economical and efficient form of portable concentrated food, was invented by him. This gained for him a medal at the London World's Fair of 1851 and he was elected an honorary member of the London Society of Arts. Meeting with opposition from the army contractors, he was unsuccessful in the manufacture of his biscuit and lost his entire means. He then removed to the North and turned his attention to the preservation of milk, and in 1853 applied for a patent for «producing concentrated sweet milk by evaporation in vacuo, the same having no sugar or other foreign matter mixed with it,» but failed of securing it until 1856. Later, the New York Condensed Milk Company was formed and works were established at Brewster's Station, N. Y., and at Elgin, Ill. During the Civil War his condensed milk was extensively used in the army and navy. Condensed meat juices were then experimented upon and he produced an extract of beef of superior quality, which at first he made in Elgin but later at Borden, Tex. Later he produced excellent preparations of condensed coffee, cocoa and tea, and in 1862 patented a process by means of which fruit-juices, such as apples, currants and grapes, could be reduced to one-seventh of their original bulk. Borden amassed a great fortune from his patents.

BORDEN, Robert Laird, Canadian statesman: b. Grand Pré, Nova Scotia, 26 June 1854, the son of Robert Borden, schoolmaster and farmer, and Eunice Laird Borden. He is descended from Samuel Borden, surveyor, who came to Falmouth from the American colonies in 1760. He was educated at Acacia Villa Academy, Horton, and afterward taught school in his native province and at Glenwood Institute, New Jersey. In 1874 he returned to Nova Scotia and began the study of law and was called to the bar in 1878. He soon acquired a large practice in the courts of Nova Scotia and the Supreme Court of Canada, and was engaged in several cases before the Judicial Committee of the Privy Council. He became a Q.C. in 1890. He was president of the Nova Scotia Barristers' Society, 1893–1904. At first identified with the Liberal party, he seceded in 1891 on the question of reciprocity with the United States. He was elected to the Dominion House of Commons for Halifax in 1896, but was defeated in 1904. He was elected for

Carleton in 1905 and in 1908 was returned for both Carleton and Halifax but elected to sit for Halifax. In 1901, on the retirement of Sir Charles Tupper from the leadership of the Liberal-Conservative party he was elected to the vacant position. His policy, enunciated in the Halifax platform of 1907, embraced provincial autonomy, civil-service reform, placing of the government railways under an independent commission, nationalization of telegraphs and telephones and preferential trade within the empire. An innovation was introduced in Canadian public life by the Laurier administration in 1905, when an additional sessional indemnity of $7,000 was voted to the official leader of the opposition in the Dominion Parliament. Mr. Borden, on the Laurier Naval Service Bill of 1910, advocated the contribution to the imperial authorities of an amount sufficient to purchase two dreadnoughts. He offered strenuous opposition to the Taft-Fielding reciprocity agreement, and in the general election of 1911 on that issue he was returned to power, and entered office as Prime Minister 10 Oct. 1911. The Liberal-Conservatives had also in that election received the support of the Nationalists of Quebec, who resented what they regarded as Laurier's imperialistic naval policy. In 1912 Mr. Borden became a member of the Imperial Privy Council. His Naval Service Bill of 1912, which provided for the contribution to the imperial navy of three battleships of the largest class, at a cost of $35,000,000, passed the House of Commons but was rejected in the Senate.

The outbreak of the European War in August 1914 was followed by the calling of an emergency session of the Canadian Parliament, when, with the loyal co-operation of Sir Wilfrid Laurier and the opposition, men and money were pledged to aid Great Britain in the struggle with the Central Powers. Within three months of the declaration of war a force of 33,000 men was sent overseas; and up to June 1917, 430,000 men were raised by voluntary enlistment. During the continuance of his first ministry the war held the predominant place in public affairs. In addition to the magnificent contribution in men, large loans were raised and a great new munitions industry established. There was, however, strong criticism of administration in several departments, and notably in the Militia Department.

Sir Robert Borden — he was created G.C.M.G. in June 1914 — visited England and the western front in the summer of 1915 and received, among other honors, the freedom of the city of London and the Grand Cross of the Legion of Honor. The creation of an Overseas Minister of Militia in the following year led to some sharp correspondence with Sir Sam Hughes, the Minister of Militia, and a demand (9 November) for that Minister's resignation. The urgency of the war situation led to an extension of the life of the Parliament for one year, to October 1917. In the spring of 1917 an adjournment of Parliament was made to permit the Prime Minister to go to England to confer with the British authorities and with other representatives of the self-governing dominions. On his return he intimated the government's intention of passing through Parliament a conscription act to provide adequate reinforcements for the Canadian armies overseas. Negotiations were, in the beginning of June, opened with Sir Wilfrid Laurier, the Liberal leader, with the view to the formation of a union government by the fusion for war purposes of the two great parties. Those proposals were declined by Sir Wilfrid, partly on the ground that the policy of the proposed government was announced prior to the extension of the invitation to him to join it, and he himself was in favor of a referendum before so drastic a measure was carried through. For the time being the effort at fusion failed, but the Military Service Bill, together with a Canadian Northern Railway purchase bill, passed through Parliament. A second attempt to form a union ministry — made by Sir Robert Borden on the dissolution of Parliament prior to the general election which became inevitable on the cleavage produced by the conscription bill — was more successful, and in October a union government was formed which, with the exception of Sir Wilfrid Laurier and representatives of the Liberalism of Quebec, was fairly representative of both great political parties in all the provinces. This government, pledged among other things to enforce conscription, to make better provision for soldiers and their dependents and to free the civil service from the evils of the patronage system, was divided into two cabinets, each presided over by the Prime Minister, for War and Reconstruction. As a union ministry it went before the country at the general election held on 17 Dec. 1917. He resigned the premiership in 1920. See CANADA.

BORDEN, Simeon, American inventor and surveyor: b. Fall River, Mass., 29 Jan. 1798; d. 28 Oct. 1856. He instructed himself in mathematics and devised successful surveying instruments. The first American geodetic survey was his work. In 1848 he began the construction of railroads. He published 'A System of Useful Formulae Adapted to the Practical Operations of Locating and Constructing Railroads' (1851). He also accomplished the feat of stringing a telegraph wire at a height of 220 feet from the Palisades to Fort Washington across the Hudson, a distance of more than a mile.

BORDENTOWN, N. J., city in Burlington County, on the Delaware River, the Delaware and Raritan Canal and the Pennsylvania Railroad, 57 miles southwest of New York. The city is the seat of the Bordentown Military Institute, the Saint Joseph's Academy for girls (Roman Catholic) and the Bordentown Female College. It carries a large trade in the agricultural products of the surrounding district and contains several important industrial establishments, such as steam forge and iron works, foundry and machine shops, worsted mills, shirt factory, canning factories, a shipyard and other industries. The city was incorporated in 1849. For many years Joseph Bonaparte, brother of Napoleon I, lived near Bordentown as did also Marshal Joachim Murat. The city in 1913 adopted the commission form of government. Consult Woodward, 'Bonaparte's Park and the Murats' (1879). Pop. 4,500.

BORDER RUFFIANS, a name given, after the Kansas-Nebraska Bill of 1854, to the pro-slavery Missourians who acted as the allies of the slave element in Kansas, crossing the boundary to vote, by which means they organized the first government against the bona-fide free-labor residents by a vote of nearly double the inhabitants of the Territory. They kept the State in anarchy for three years, terrorizing the inhabitants by murder, arson, the sack of towns and other outrages. The most graphic comment is the fact that they adopted this term of their enemies and prided themselves on it as an excellent joke. See Kansas-Nebraska Bill. Consult Thayer, E., ‹A History of the Kansas Crusade.›

BORDER STATES, before the Civil War, the line of slave States lying next the free States: Delaware, Maryland, Virginia, Kentucky and Missouri. The term was sometimes improperly made to include North Carolina and Tennessee, probably because their mountain districts held so large a proportion of loyalists; and Arkansas, for no special reason. Their political position was dictated by the facts that: (1) After the prohibition of the slave trade one of their chief industries was breeding slaves for exportation to the cotton, rice and sugar plantations of the southernmost States. In the Virginia convention of 1832 it was said to be the most profitable in the State. (2) From their position they were the chief sufferers from the escape of fugitive slaves; in 1850 this was estimated at a loss of $3,000,000 a year, and these States were the most insistent advocates of the Fugitive Slave Law and its enforcement; and in 1860 a Missouri senator urged the creation of a Federal police to patrol the border line for this purpose. (3) In case of war they would be the chief battlefield. They therefore furnished the backbone, if not the genesis of every political movement to stop the slavery agitation or conciliate the sections. The strength of the Know-Nothing party of 1856 and the Constitutional Union party of 1860 (Bell-Everett) was almost exclusively in the border States; the Peace Conference of 1861 and the proposed Crittenden Compromise were the work of these States. They tried to prevent the outbreak of hostilities, and when the war began the governor of Kentucky went so far as to attempt making his State a neutral power outside both governments, and forbade either of them occupying it without the consent of the State authorities. Finally, however, they split up according to their natural affinities; the three not border States at all — North Carolina, Tennessee and Arkansas — seceded, with Virginia; while in Kentucky, Maryland, Delaware and Missouri, the loyal element, with government help, prevented the State from going out. They never gave up hope through the war, however, of reconciling differences by a convention of all the old States, North and South.

BORDER WAR, a name given during the struggle for Kansas to the intermittent civil war in that Territory, about 1854–58, between the free-soil and the slavery parties. It was begun by the attempt of the Missouri slavholding party («Border Ruffians,» q.v.) to reclaim by violence what the actual settlers had won by colonization; many of the worst atrocities were perpetrated, and all the temporary success of the slavery side won, by bodies of men who were not residents of Kansas at all. This caused John Brown (q.v.) to move there from northern Ohio with his sons, and fight against them. Of the other partisan leaders on that side, the most notable was James Montgomery, who, however, was a bona-fide settler. The most efficient leaders among the Missourians, or border ruffians, were David R. Atchison of Missouri and Gen. B. F. Stringfellow.

BORDES, Charles, French organist, composer and author: b. Vouvray sur Loire 1861. He was a pupil of César Franck; in 1890 became organist of Saint Gervais in Paris and in 1898 founded the Saint Gervais School Cantorum which became famous for its choral renditions of Bach and other sacred works. Besides his compositions he wrote ‹Archives de la tradition basque› (1890); ‹Du sort de la musique religieuse en France› (1906); and is editor of the ‹Anthologie des maîtres religieux primitifs.›

BORDIER, bôr'dē'ā, **Henri Leonard,** French historical writer: b. Paris, 8 Aug. 1817; d. there, 31 Aug. 1888. He graduated in law, making a special study of palæographic archives (1840), and continued to devote his energy to historical studies. He became successively assistant to the historian Auguste Thierry; assistant in the Academy of Inscriptions; secretary of the École des Chartes; member of the Commission of the Departmental Archives belonging to the office of the Minister of the Interior (1846); archivist of the national archives (1850). On the establishment of the empire he lost his position; but in 1872 he became honorary librarian in the department of manuscripts in the National Library. For many years he was a member of the committee of the French Protestant Historical Society for which he prepared many noteworthy works. Among his published books are ‹Histoire générale de tous les dépôts d'archives existant en France› (1855); ‹Les Églises et monastères de Paris› (1856); Latin text with French translation of the ‹Libri miraculorum aliaque opera minora› of Gregory of Tours (4 vols., 1857–64); and also a translation into French of his ‹Historia Francorum› (2 vols., 1859–61); ‹Les inventaires des archives de l'Empire› (1867); ‹Une Fabrique de faux Autographes› (1869); ‹Chansonnier huguenot du seizième siècle,› (1869); ‹L'Allemagne aux Tuilleries, de 1850 à 1870, collection de documents tirés du cabinet de l'Empereur› (1872); ‹Le Saint Barthélémy et la critique moderne› (Geneva 1876); ‹Nichalas Castellin de Tournay›; ‹L'école historique de Jerôme Bolsec› (Paris 1880); ‹Description des peintures et autres ornements contenus dans les manuscrits grecs de la Bibliothèque Nationale› (1885).

BORDIGHERA, bôr-dē-gā'rȧ, Italy, town on the Mediterranean coast, in the district of San Remo and province of Porto Maurizio, on the Riviera, 91 miles southwest of Genoa and seven miles from the French frontier, a favorite winter residence for invalids, having been made fashionable by the visits of the members of the English royal family. Few places on the Riviera are better fitted for the accommodation of invalids and tourists. In addition to the usual facilities for the entertainment of strangers, the town has a library, museum, a theatre and a fine promenade. The snowfall is very slight. The town has been repeatedly the victim of earthquakes, the last serious visitation taking place in 1887. Pop. 4,229.

BORDONE, bôr-dō-nȧ, **Paris,** Italian painter of the Venetian school: b. Treviso 1500; d. 1571. Under Titian he made rapid progress in painting. The execution of many works for his native city and for Venice spread his fame as far as France, whither he was invited by the King. The galleries of Dresden and Vienna possess several of his pieces. The New York Historical Society also possesses one of his paintings. His most famous picture is the 'Old Gondolier presenting a Ring to the Doge'; it is considered one of the masterpieces of the Venetian school. Other examples of his work are 'Prophecy of the Tiburtine Sibyl,' in Florence; 'Combat of the Gladiators,' in Vienna, and 'The Chess Players,' in Berlin. Consult Berenson, 'Venetian Painters' (New York 1909); Bailo and Biscaro, for his life and works (Treviso 1901).

BORE, or **EAGRE,** words of Norse origin (from bora, hole; Ægir, sea-god); designating the inflowing phenomenon which occurs in some rivers in spring-tides. At such times as the tide advances the water is suddenly thrown in as if in a mass, and then pursues its course up the river, and in opposition to the current, presenting a volume of water moving with great rapidity and resistless force, and with a height varying from two or three feet, as in the Severn, Trent, Solway and Seine, to more than 12 feet in the Brahmapootra and Tsien-Tang-kiang. The last is said to have a rise of 20 feet, and advances with a loud roar, at the rate of 10 miles an hour. The tide in the Bay of Fundy creates the great bores which rush up the river channels of the bay. «Ware Eagre» is still a warning cry on European rivers to herald the bore's advance. The bores are caused by the disproportion between the volume of the tidal wave and the receiving power of the rivers up which they flow. Consult Darwin, 'The Tides' (Boston 1898).

BORE, the cavity of a steam engine cylinder pump barrel, pipe, cannon, barrel of a firearm, etc. In mechanics it is expressed in inches of diameter; in cannon formerly in the weight in pounds of solid round shot adapted thereto, but since the introduction of modern rifled ordnance of the breech loading pattern, the bore of cannon is always expressed in inches of diameter or in the equivalent of inches.

BOREAS, the north wind, worshipped by the Greeks as a deity; residing in a cave of Mount Haemus in Thrace, and represented with wings, which, as well as his hair and beard, were full of flakes of snow; instead of feet he had the tails of serpents, and with the train of his garment he stirred up clouds of dust. Boreas, according to Hesiod (Theogony 379), was the son of Astræus and of Eos, brother of Hesperus, Zephyrus and Notus. When Apollo and his favorite Hyacinthus were once playing at quoits, he blew the quoit of the former, of whom he was jealous, upon the head of the youth, who was killed by the blow. By Oreithyia, daughter of Erechtheus of Athens, he was father of Cleopatra, Chione, Calaïs and Zetes. The last two took part in the Argonautic expedition.

BORECOLE, a pot-herb. See Kale.

BOREGAT. See Rock Trout.

BORELLI, Giovanni Alfonso, Italian physician and scientist: b. Naples 1608; d. Rome, 31 Dec. 1679. After studying medicine he both practised and professed it at various places, but particularly at Pisa and Messina, and distinguished himself as the leader of those who have been called mathematical physicians, from regarding the human body as a kind of hydraulic machine, and then attempting to explain all its motions and functions in accordance with the principles of mathematics. He appears to have possessed very original and inventive powers, and made various discoveries, among which may be mentioned that of an apparatus apparently of the nature of a diving-bell, by which persons could descend into the water, remain in it and move about or rise and sink at pleasure, and of a boat by which two or more persons might row themselves beneath the water in any direction. His works discuss many important subjects in medicine, mathematics and philosophy; but the great work on which his fame rests, though not published till after his death, is entitled 'De Motu Animalium' (Eng. trans. 'The Flight of Birds'), and in so far as it relates to mere animal mechanics is full of interest and instruction; but when he attempts to apply his mathematical principles he falls into egregious blunders, and stumbles at every step.

BORELLI'S COMET. See Comet.

BORER, Round-headed and Flat-headed, insect enemies of several trees. See Apple.

BORGHESE, bor-gā'sā, the name of a patrician family of Siena, Italy, which has been more or less distinguished since the middle of the 15th century. A jurisconsult, of the name of Marco Antonio Borghese, who was employed by the papal court in the early part of the 16th century, appears to have laid the foundation of its fortunes at Rome. His third son, Camillo, became Pope Paul V in 1605, and he lavished the honors and riches which his place enabled him to command on his relatives. For a son of his elder brother, named Marco Antonio Borghese, he procured the princedom of Sulmona and a grandeeship in Spain. His brother, Francesco, he made the leader of the troops sent against Venice in 1607, to maintain the papal cause against the opposition of that republic. Scipione Caffarelli, a nephew, he created cardinal. Paolo, the son of Marco Antonio, married Olympia Aldobrandini, the only child of the Prince of Rossano, and grandniece of Clement VIII, and thus introduced the wealth of the Aldobrandini into the Borghese family. The son of Paolo, named Giovanni Battista, was the ambassador of Philip V to the court of Rome, where he died in 1717. His son, Marco Antonio, was viceroy of Naples in 1721, and another of the same name, descended from him, became a noted collector of works of art, with which he adorned his sumptuous villa on the Pincian hill. See Borghese, Camillo Filipo.

BORGHESE, Camillo Filipo Ludovico, formerly Duke of Guastalla, Prince of France, etc.: b. 1775; d. Florence, 10 April 1832. When the French invaded Italy he entered their service and showed great attachment to the cause, in particular to General Bonaparte, whose sister, Marie Pauline, he married. In

1804 he became a French prince and received the grand cross of the Legion of Honor, and at the outbreak of war against Austria, 1805, became commander of a squadron of the imperial guard. After its termination his wife received the duchy of Guastalla and he was created Duke of Guastalla. After having served in 1806 in the campaign against the Prussians and Russians, and after having been sent to Warsaw to prepare the Poles for a revolt, the Emperor appointed him governor-general of the provinces beyond the Alps. He fixed his court at Turin and became very popular among the Piedmontese. After the abdication of Napoleon he broke up all connection with the Bonaparte family and separated from his wife. The Prince sold to the French government for the sum of 8,000,000 francs 322 works of art which ornamented the palace of his ancestors, known under the name of the Villa Borghese. Among them were several masterpieces; for example, the ‹Borghese Gladiator,› the ‹Hermaphrodite,› the ‹Silenus,› the ‹Dying Seneca,› ‹Amor and Psyche.› Bonaparte provided for the payment out of the national domains in Piedmont, which the King of Sardinia confiscated in 1815; at the same time, in consequence of the second invasion of France, the Prince received back part of these treasures of art. In 1818 he sold Lucedio, in Savoy, for 3,000,000 livres. In the kingdom of Naples he possessed the principalities Sulmone and Rosano. He was one of the richest Italian princes.

BORGHESE, Marie Pauline (Princess), sister of Napoleon: b. Ajaccio, 20 Oct. 1780; d. 9 June 1825. When her first husband, General Leclerc, was sent to Saint Domingo with the rank of captain-general, Napoleon ordered her to accompany her husband with her son. She embarked in December 1801, at Brest, and supported with courage the hardships of a campaign that ended in the withdrawal of the French troops. After General Leclerc's death she married, at Morfontaine in 1803, the Prince Camillo Borghese. Her son died at Rome soon after. With Napoleon she had many disputes and as many reconciliations, for she would not always follow the caprices of his policy. Yet even the proud style in which she demanded what her brothers begged made her the more attractive to her brother. Once, however, when she forgot herself toward the Empress, whom she never liked, she was obliged to leave the court. She was yet in disgrace at Nice when Napoleon resigned his crown in 1814. Before the battle of Waterloo she placed all her diamonds, which were of great value, at the disposal of her brother. They were in his carriage which was taken in that battle, his intention having been to return them to her. She lived afterward separated from her husband at Rome, where she occupied part of the palace Borghese and where she possessed, from 1816, the Villa Sciarra. Her house, in which taste and love of the fine arts prevailed, was the centre of the most splendid society at Rome. When she heard of the sickness of her brother Napoleon, she repeatedly requested permission to go to him at Saint Helena. She finally obtained her request, but the news of his death arrived immediately after. A marble portrait statue by Canova, representing her as Venus, is now in the Borghese collection at Rome.

BORGHESI, Bartolommeo (Count), Italian numismatist and epigraphist: b. Savignano, near Rimini, 11 July 1781; d. San Marino, 10 April 1860. Son of a learned father whose hobby was collecting coins, he made valuable additions and followed the study of numismatics as a branch of historical research. The coins in the Vatican were entrusted to him to arrange and catalogue, and he became practically the founder of modern epigraphy. He published ‹New Fragments of the Consular Fasti of the Capitol› (2 vols., 1820), and in the monumental ‹Corpus Inscriptionum Latinarum,› completed by the University of Berlin, directed by Mommsen, was achieved the publication of a collection of all ancient Roman inscriptions, originated by Borghese. His correspondence and contributions to periodical literature formed an immense mass of material, and after his death Napoleon appointed a commission to collect and publish his works, which appeared as ‹Œuvres complètes› (10 vols., 1862–97).

BORGI, bôr-jē, **Giovanni:** b. Rome 1732; d. 1798. A philanthropist who, though poor, inspired the founding of societies for the education of vagrant children.

BORGIA, bôr'jä, **Cesare,** Italian ecclesiastic and soldier: b. 1476; d. 12 March 1507. He was the natural son of Rodrigo Borgia and a Roman lady named Vanozza. His father, who in 1492 became Pope, with the title of Alexander VI, made him a cardinal. When Charles VIII of France made his entry into Rome, Alexander was obliged to treat with him and delivered Cesare Borgia into his hands as a hostage, but he escaped a few days later. In 1497 Alexander bestowed the duchy of Benevento on his eldest son, Giovanni, who had already received from the King of Spain the duchy of Gandia. Giovanni died shortly after his investiture and Cesare has been accused of murdering his brother out of jealousy, but historical proof of this charge is utterly lacking. His father permitted him to abandon his ecclesiastical office and devote himself to the profession of arms and sent him to France to carry to Louis XII the bull for divorce and dispensation for marriage which he had long desired to obtain. Louis rewarded Borgia with the duchy of Valentinois, a bodyguard of 100 men and 20,000 livres a year, and promised to aid him in his projects of conquest. In 1499 Cesare married a daughter of King John of Navarre and accompanied Louis XII to Italy. In two successive campaigns he made himself master of the Romagna, Perugia, Piombino and the duchy of Urbino. His vaulting ambition planned a reconstructed kingdom of central Italy with himself at its head, and a powerful league was formed against him. His own officers attempted to arrest his progress, but he misled them by a feint, divided them, invited them to Sinigallia and there passed on them sentence of death (December 1502). The death of his father on 17 Aug. 1503 materially altered his prospects; the accession of Julius II to the papal throne was followed (January 1504) by his renunciation in favor of the Pope of all claims to the Romagna, which he had governed with justice and integrity, earning the regard of his subjects. Borgia was subsequently arrested; spent two years as a prisoner in Spain; made his escape to his brother-in-law, the King of Navarre, whom he accompanied in a campaign against Castile, and was killed by a shot before the castle of Viana. His active career was lived within four years; but his boundless ambition, indomitable energy, disregard of all laws, genius in war and skill in administration have rendered him one of the most extraordinary figures in the period of the Renaissance. Consult Creighton, 'History of the Papacy' (London 1897); Fyvie, 'Story of the Borgias' (New York 1913); Villari, 'Machiavelli' (London 1892); Yriarte, 'César Borgia' (Paris 1889).

BORGIA, Francisco, or **Saint Francis** (DUKE OF GANDIA), Spanish ecclesiastic: b. Janda, Spain, 28 Oct. 1510; d. Rome, 30 Sept. 1572. He was eminent as a soldier and statesman and enjoyed the confidence and friendship of Charles V, who appointed him viceroy of Catalonia. While very young he married a noble Portuguese lady, Eleonora de Castro, by whom he had a large family. He was always very strict in his morality and exact in his religious duties. After the death of his wife he entered the Society of Jesus and was ordained priest in the 40th year of his age. On 2 July 1565 he was elected general of the Society and remained in office until his death. Several bishoprics and the dignity of cardinal were repeatedly pressed upon him but he refused them all. Clement X signed the bull for the canonization of Saint Francis Borgia on 20 June 1670.

BORGIA, Lucrezia, daughter of Rodrigo Borgia, who ascended the papal throne in 1492 under the name of Alexander VI, and sister of Cesare Borgia (q.v.): b. 1480; d. Ferrara, 24 June 1519. When a mere child she was betrothed to a gentleman of Aragon, but her father, on attaining the popedom, thought the match beneath her, and broke the engagement, marrying her to Giovanni Sforza, lord of Pesaro. After she had lived with him for four years, Alexander dissolved the marriage on the ground of the husband's impotency, and gave her to Alphonso, Duke of Bisceglia, natural son of Alphonso II of Aragon. Two years after her husband was assassinated in a quarrel with Cesare Borgia. Within the course of a year she married Alphonso d'Este, son of Ercole, Duke of Ferrara. Here she became a liberal patroness of poets, who endeavored to repay her benefactions by lauding her as the pattern of every virtue. The character of Lucrezia Borgia has been the subject of much controversy, but recent historical researches have placed her in a much fairer light and it has been shown beyond dispute, that after her marriage to Alphonso d'Este her life was a model of virtue and beneficence. Consult Corvo, 'Chronicles of the House of Borgia' (New York 1901); Fyvie, 'Story of the Borgias' (ib. 1913); Gregorovius, 'Lucrezia Borgia' (Stuttgart 1875); Mathew, 'Life and Times of Rodrigo Borgia, Pope Alexander VI' (New York 1912); Pastor, 'Geschichte der Päpate' (3 vols.).

BORGIA, Rodrigo. See ALEXANDER VI.

BORGIA, Stefano, Italian ecclesiastic: b. Velletri, 3 Dec. 1731; d. Lyon, 23 Nov. 1804. He was brought up by his uncle, Alexander Borgia, archbishop of Fermo, and in 1750, on becoming a member of the Etruscan Academy of Cortona, commenced at Velletri to form a museum which has since become one of the richest private collections in existence. In 1759 he was appointed by Benedict XIV governor of Benevento, and in 1770 he became secretary to the College of Propaganda, which brought him into immediate relation with missionaries to all parts of the world, and enabled him, at comparatively little expense, to enrich his museum with manuscripts, coins, statues, idols and all the other rarities which each country possessed. In 1789 Pius VI made him a cardinal, and at the same time appointed him inspector-general of the foundling hospital, into which he introduced extensive reforms. In 1797 the revolutionary spirit which had broken out in France extended itself to Rome, and the Pope, as the best means of counteracting it, gave all his confidence to Borgia and installed him as dictator. The situation was extremely difficult, but he showed himself worthy of the trust, and gained such ascendency over the public mind that tranquillity and good order remained uninterrupted till 1798. By this time the French were at the gates, and the popular party, becoming dominant, established a republic. The Pope was compelled to depart, and Cardinal Borgia, at first arrested, was ordered, on obtaining his liberty, to quit the papal states. After disembarking at Leghorn he repaired to Venice and Padua, and continued regularly to discharge his functions in connection with the Propaganda as if nothing had occurred to interrupt them. He returned to Rome with the new Pope, Pius VII, who treated him with the same confidence as his predecessor. Afterward, when Pius VII was carried off to France, Borgia was ordered to accompany him, and he accordingly set out, but had only reached Lyons when he was seized with a serious illness, and died. He was the author of several antiquarian and historical works including 'Memorie istoriche della pontificia città di Benevento dal secolo VIII al secolo XVIII' (3 vols., 1763–69), and deserves honorable mention for his liberal patronage of arts and artists. It is said that he once sold a gold plate from his collection to defray the expense of printing San Bartolommeo's 'Systema Brahmanicum.'

BORGLUM (John) Gutzon (de la Mothe), American sculptor and painter: b. Idaho, 25 March 1867. He studied at the San Francisco Art Association, and the Julian Academy of Paris 1890–93. In 1893 he returned to California, removing to London in 1895. From 1896 to 1901 he exhibited both painting and sculpture in Paris and London, and was elected to the Royal Society of British Artists and to the Société Nationale des Beaux-Arts. He settled in New York in 1902. A determination to produce American art, chiefly manifested by choice of subject, gained for him a considerable section of the public. His success in other circles is obtained by his skilful manipulation of his material, due to thorough schooling and a judicious adoption of the free technique of Rodin. He is an able representer of movement, as in his 'Mares of Diomedes' at the Metropolitan Museum in New York, though he uses the quality rather in the manner of an illustrator than of a creator of sculptural design. Gutzon Borglum is a member of the Architectural League of New York, and the American Numismatic Society. He has received the gold medal of the Association of Western Arts, and one from the Saint Louis Exposition of 1904. Well-known works by him are the Sheridan monument, Washington, D. C.; the colossal head of Lincoln at the Capitol; Collis P. Huntington, New York; Wyatt Memorial, Raleigh, N. C.; ‘Pursued,’ two youthful figures upon horseback (in possession of the Kaiser); ‘The Boer,’ an eqestrian figure; the small and characteristic figures of John Ruskin (Metropolitan Museum), and Nero; a number of highly original gargoyles for Princeton University; the colossal figures of the 12 apostles for the cathedral of Saint John the Divine, New York; statue of Lincoln, Newark, N. J.; statue of Henry Ward Beecher, Brooklyn; Altgeld statue, Chicago; and the marble figures ‘Wonderment of Motherhood’; ‘Modern Atlas’; ‘Night’; ‘Babes in the Wood.’ His paintings include ‘Captive Pan’; ‘Abandoned’; ‘Iago and Cassio’; and mural decorations in Leeds and Manchester, England.

BORGLUM, Solon Hannibal, American sculptor: b. Ogden, Utah, 22 Dec. 1868. He spent his youth in Fremont, Neb., and his early manhood on a cattle ranch. At the age of 24 he turned to art, spent two years with his brother Gutzon in California, and in 1895 entered the art school of Cincinnati. His first group, a ‘Horse Pawing a Dead Companion,’ won a special prize, and in 1897 he won a scholarship which brought him to Paris. There he studied under Louis Rebisso and Frémiet. He achieved honorable mention with his ‘Lame Horse’ in the Salon of 1899, and attracted much attention by the originality of his subjects, taken from the life of the western frontier, which he himself had experienced. His art has perpetuated vanishing types — the cowboy, the ranchman, Indian and the animals of the plains, with truth and inspiration and shows little French influence, even in technique. After 1900 he was active in New York. He became a member of the National Sculpture Society in 1901 and was made an associate of the National Academy in 1911. Among other awards he has received an honorable mention at the Salon of 1899, a silver medal from the Pan-American exposition of 1901, and a gold medal at Saint Louis in 1904 Among his principal works are ‘On the Borders of White Man's Land’ and ‘Bulls Fighting’ (Metropolitan Museum, New York); busts of C. A. Schieren, Simon Newcomb and the Packer Memorial (Brooklyn Institute Museum); equestrian statue of General Gordon (Atlanta, Ga.); Soldiers and Sailors' Monument (Danbury, Conn); ‘Stampede of Wild Horses’ (Cincinnati Museum); ‘The Last Roundup’ (Metropolitan Museum, New York); ‘Burial on the Plains’; ‘Tamed’; ‘Just Born’; ‘Evening’; and The Bucking Broncho.’ His later works include an equestrian statue of Captain O'Neill (Prescott, Ariz., 1907); portrait reliefs of Civil War generals in the Vicksburg National Park and ‘Private Jones of the Confederate Army,’ a bronze statute in Lynchburg, Va.

BORGNE, bôr-nė, **Lake,** Louisiana, a body of water situated in the southeastern part of the State. Though termed a lake, it is strictly the termination of that large arm of the Mexican Gulf known as Pascagoula Sound, being united to that by a pass or strait crossed by a line of small islands and faced on the east by Grand Island. Lake Borgne is also connected with Lake Pontchartrain by the Rigolet Pass and approaches within 15 miles of New Orleans. Its greatest extent is in a northeast and southwest direction, in which its length is about 30 miles. Lake Borgne forms a part of the western boundary of the Mississippi Delta.

BORGOGNONE, bor-gon-yō'nā, **Ambrogio di Stefano,** also called Ambrogio da Fossano, or il Bergognone, a distinguished Italian (Lombard) painter: b. at or near Fossano about 1445; d. 1523. The best studies of his life and works are by L. Beltrami and G. Zappa, and the substance of their accounts is clearly restated in Thieme-Becker, (Vol. IV, pp. 358–60). The year of his birth is not known, the earliest notice of him being in the records of the Milan “Università dei Pittori,” where his name appears as “magister” in 1481; and his earliest known painting dates from the same period, roughly speaking. His last signed work known to us, painted for the church at Nerviano and now in the Brera at Milan, is dated 1522. Shortly before that time the most admired of all the paintings by this “gentle and pious master”— the great apse fresco of the ‘Coronation of the Virgin’ in San Simpliciano, Milan, was created and this represents most perfectly and most nobly the old Lombard art traditions. It has been customary for art critics to deny that Borgognone was at all subject to the influence of the contemporaneous Leonardo school; Zappa, however, finds in the figures of some of Borgognone's paintings (for example, the four pictures at Lodi representing scenes from the life of the Virgin) intimations of precisely that influence, though in only a slight degree. But in general it may be said that Borgognone held aloof from the newer art tendencies and preserved in his works the expression of deeply-felt religious experience, his spirituality contrasting with those manifestations of interest in physical charm which characterized much of the art of his time. During the years 1488 to 1494 or 95 Borgognone executed for the Certosa of Pavia a series of paintings only less famous than the San Simpliciano fresco. Consul his biography by Bona (Fossano 1897).

BORGOGNONE, bôr-gō-nyō-nė, **Jacopo Cortesi,** or, more properly, Jacques Courtois,— in Italian Giacomo or Jacopo Cortesi — called Borgognone, French painter: b. Burgundy 1621; d. Rome 1675. He studied in Italy and painted there, probably with success, until “in the full flower of his virility, he went to live with the Jesuits at Rome,” as P. T. Venturi writes in *L'Arte* (Vol. XIII, p. 216. Roma 1910). His name has been overlooked hitherto by the editors of other works of reference, even those devoted exclusively to artists and the fine arts.

BORGU, bôr-goo', Africa, a district in the western Sudan, lying about lat. 10° N., and stretching from the meridian of Greenwich east to the Niger. It is hilly in parts, but much of it is well watered and extremely fertile. Among its numerous productions are rice, grain, indigo, cotton, bananas and citrons. The inhabitants (chiefly Fulahas and pagan negro Bariba) are, in the eastern part, under the protection of

British officials of northern Nigeria, while, in the western part, they are subject to that of the French colony of Dahomey. Bussa, on the Niger, is the main settlement.

BORIC ACID. See Boracic Acid.

BORING, a species of circular cutting in which a cylindrical portion of a substance is gradually removed. When tubes of metal are to be formed, a cast is, in some cases, made in solid metal, and the whole of the bore is produced by the boring-machine: in others the cast is made hollow at first, and the borer is only used to give uniformity and finish to the inside of the tube. In boring cannon sometimes the tool is made to revolve while the cannon is at rest, and sometimes the cannon is made to revolve while the tool is at rest. By the latter arrangement the bore is said to be formed with more accuracy than by the other method of putting the borer in motion.

In the jewelry and small metal industries, hand drills, which consist of a spindle with steel bits, to which reciprocating rotation is given, are the implements for piercing small holes. The boring of holes in metal plates is effected by means of drills driven by machinery. The drill is inserted in the end of a vertical spindle, which revolves in a fixed frame and is driven by the bevel wheels. The metal to be bored is placed on a table or other support, below the drill; and the up and down motion, or end pressure and off action, of the drill is effected by the hand gear turning the screw; which, being coupled to the top of the spindle, presses it down or raises it, according to the way it is turned. The spindle slides vertically in the collar forming the axis of the bevel wheel, but is carried round with it by means of a pin which projects into a groove.

As applied to the earth and to rocks, boring embraces two classes of operations — boring of shot-holes for blasting, and the sinking of bores in prospecting for minerals and in forming wells for water, brine and mineral oils. Blast-holes in rocks are made from one to two — sometimes more — inches in diameter, and may pierce to the depth of nine feet. Such holes are most simply made in hard rock by a steel-pointed drill, struck by a hammer, and turned partly round after each blow to make the hole cylindrical. The addition of a little water serves to preserve the temper of the boring tool, and makes the hole more easy to cut. In soft rock, whenever the hole is to be vertical, a jumper is used. This is a weighted drill, which acts merely by its own weight when let fall from about a foot in height. The powdered stone is removed at intervals by a scraper. But in all great engineering undertakings rock-boring machinery now supplants hand work. The machines are principally devised to imitate the percussive action of the hand drill, the boring chisel being worked and rotated by compressed air, and sometimes directly by steam. The compressed-air machines possess the great advantage of aiding in the ventilation of the working — often a most important consideration, seeing the operations are chiefly carried on in confined spaces where large volumes of poisonous gases are evolved from explosions. The earliest practical rock-boring machine was that of Sommeiller, one of the engineers of the Mont Cenis tunnel, at which undertaking the apparatus was first used. Now the forms of percussion machines are very numerous, improvements being directed toward lightness and simplicity of parts, and to the method — automatic or otherwise — of advancing the boring-tool as the work proceeds. Among the best known machines are the Barrow, Burleigh, Darlington, Ferroux, Ingersoll and McKean rock-borers. Diamond drills working in the manner described below are also used. Brandt's rotatory borer is an apparatus similar in action to the diamond drill, but with a crown of hardened steel in place of cutting diamonds. The tool is pressed against and rotated by water power. An apparatus similar in principle to the brace and bits of the carpenter is used with advantage in uniform rock, such as slate.

The bores for deep wells of all kinds, and for discovering the mineral contents of a region, come under one category. As a preliminary operation in mining, boring is of the utmost importance for discovering the position, thickness and dip of mineral strata or lodes, and for ascertaining the nature of the overlying deposits. Bores are made by three classes of implement — (1) boring-rods, (2) rope borers, and (3) diamond drills.

The rod-boring instrument consists of an iron shank having a cross-bar at the top and a hollow screw at the bottom; to this all the successive boring instruments are fastened. A simple chisel is first attached to the screw, and one or two men press upon the cross-bar, and, at the same time, force it round like an auger; while another workman, by means of a lever erected overhead, with a chain descending from it to the cross-bar, gives an up-and-down motion to the instrument. When the chisel becomes clogged, from the accumulation of material which it has loosened, it is exchanged for a cylindrical auger, provided with a valve, which scoops out the separate material; and thus by alternate chopping and scooping the work is carried on. The nature of the strata is determined with considerable facility and certainty by examining the fragments brought up by the auger. As the work advances, successive lengths of rod are screwed on at the upper end. A derrick pole is erected over the bore hole for the purpose of elevating the rods, to permit the change of the tools.

The rope method of boring has been long in use among the Chinese. By it the great loss of time arising from the screwing and unscrewing of the rods at each elevation of the chisel or auger is saved. The chisel and scoop-instrument are fastened to a rope, which is alternately elevated and allowed to descend by the simple force of gravity; the instrument thus forces its way through the ground. In the softer rocks of the newer formations this method has been successfully employed in boring for artesian wells. The rope-boring machinery of Mather and Platt, of Salford, England, in which a flat hempen rope is employed, is in extensive use.

For deep well-sinking, as in the Pennsylvania oil region, where depths of 2,000 feet and more have to be reached, and for mineral prospecting, the diamond drill has of late years largely superseded all other borers. With this apparatus the earth can be pierced at any angle, which is a great advantage in investigating mineral deposits; and, moreover, the drill produces solid and continuous cores of the strata through which it passes, so that a complete section of any bore can be exposed to view. The diamond drill consists of a crown, or cylinder of steel, around one edge of which are fixed a series of black diamonds. These diamonds are so set that they project alternately a little beyond the outside and inside edge of the cylinder. This crown is screwed to lengths of iron tubing as it cuts its way by rotation into the rock, and it makes, as it descends, an annular cutting somewhat larger than the thickness of the continuous tube, which the crown and its shaft form. Thus a core of rock is cut out and held within the tube, and the pieces may be lifted out from time to time as the work proceeds. The detritus resulting from the abrasion of the ring of rock is continuously washed away by a current of water, forced down within the tubing. Diamond drills are made of many sizes, from 1¼ up to 18 inches in diameter. The prototype of the diamond drill was M. Fauvelle's hollow boring-rod with steel crown, described at the British Association meeting in 1846. See Drills and Drilling.

BORIS FODOROVICH GODUNOV, bo-res' gŏ-doo-nof', Tsar of Russia: b. about 1551; ascended the throne 1 Sept. 1598; d. 15 April 1605. He was a descendant of a Tartar nobleman Chet, and began his military service under Ivan the Terrible. When in 1581 the Tsar, in a fit of anger, murdered his elder brother Ivan, and the right to the throne was left to his younger brother Feodor, Boris was appointed a guardian of the young ruler. Through intrigue and clever diplomacy Boris gradually assumed great authority and in 1587 obtained officially the right of communicating personally with the sovereigns of other countries. Not having any experience in nor any liking for wars, Boris directed the foreign affairs of Russia in a peaceful and most astute manner and avoided armed conflicts with Sweden, the Tartars and the Turks. With Great Britain he established favorable commercial relations and in the country many flourishing colonies and townships were founded. In 1589 Boris instituted a patriarchate and assumed the throne of the first patriarch, thus placing himself above the metropolitan of Kiev. Other important reforms in ecclesiastical affairs were also made during his rule as regent. When, in 1591, the second heir to the throne, Tsarevich Demetrius, died under mysterious circumstances, which largely incriminated Boris, this omnipotent and ambitious regent not only denied a participation in the deed, but, in order to distract the public attention, set Moscow on fire and won the hearts of the people by great deeds of charity to the suffering population, which he knew how to show in a most theatrical manner. After the death of Tsarevich Feodor in 1598, Boris displayed all his astuteness and all the might of his unusual mind in a series of cleverly, though not honorable, arranged *coups*; inclining, or forcing, the Queen mother Irene and her brother to retire to a monastery and causing the clergy and *Zemski Sabor* (Parliament) to request him unanimously to ascend the imperial throne, which he finally agreed to do with a cleverly simulated reluctance. In order to gain the confidence and love of his subjects completely, Tsar Boris inaugurated at once a rule of good will; granting privileges and concessions, and suppressing crimes, thefts and other vices. His rule was in reality one of prosperity and progress in many respects. He established high schools in Moscow for which he supplied good teachers from Germany, Austria, England and France. His foreign affairs were even more peaceful and flourishing than during the regency and his relations with the Swedish and Danish courts were especially cordial on account of the prospective marriages of Boris' children into those royal families. From 1601, for three years, a famine raged in Russia; the half-insane population rushed in hordes to Moscow and men and women were dying in the streets; their corpses soon accumulated and spread pestilential germs and other evils, while wholesale murders, robberies and depositions grew apace. Boris fought the misfortune with an iron hand; distributing food and money in great, but insufficient, quantities. Toward the end of the famine (1604) the audacious ataman, Khlopka Kosoplap, appeared with huge hordes before Moscow but was routed by Boris's armies. At that time a certain Polish adventurer proclaimed himself Tsarevich Demetrius (known as «Samozvanetz» or «Self-styled») and, claiming the right of that prince, gathered a mighty army and attacked Moscow but was defeated by the imperial armies. Boris died soon afterward leaving his shaken throne to his son Feodor. Consult Pavlov, ‹Ob istoricheskom znachenii tzarstvovania Borisa Godunova› (2d ed., Saint Petersburg 1863); Byelov, ‹O Smerti Tzarevicha Dimitria› (Saint Petersburg 1873).

BORIS GODUNOV. Under the influence of historical studies, chiefly Karamzin's ‹Russian History› and Shakespeare's chronicle dramas, Pushkin tried to give an objective account of the troubled period in Russian history, from February 1598, to June 1605, and for his subject matter he accepted Karamzin's version, which was based on a doubtful popular conviction that Boris Godunov had been guilty of the death of the False Demetrius. As a drama ‹Boris Godunov› was a failure from the start, and has not been able to maintain itself on the stage, but as a literary production it is the greatest truly national historic tragedy dealing with those troubled times, and neither Schiller, nor Ostrovski, nor Alexis Tolstoy, who have treated the same subject, can compare with Pushkin's production as regards historic veracity or vividness of individual scenes or splendid delineation of characters. The language of the poem-drama is a close imitation of that of the old chronicles. Certain passages in it have justly become classical, such as the introductory scene, in which the monkish scribe Pimen in humility and simple faith expresses his profound respect for the imperial power and his love for his country. Of similar interest are the domestic scenes, in which Tsar Boris appears at his best, and the popular scenes, such as that describing the saintly fool, in which Pushkin followed closely the historical annals. There are numerous German and French translations of ‹Boris Godunov.› A study of the play, with synopses and specimen translations, will be found in N. H. Dole's ‹Shakespeare and the Russian Drama› (in *Poet Lore,* Vol. I, pp. 497–507, Vol. II, pp. 113–25, and his ‹Pushkin's Boris Godunóf: the Closing Episodes' (in Vol. III, pp. 551–64).

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BORIS GODUNOV, grand opera in three acts (often subdivided differently in performance) by Modeste Petrovich Moussorgski (libretto based on a drama by Pushkin). First produced at Saint Petersburg 24 Jan. (new style 6 Feb.) 1874. Moussorgski was one of a group of amateur musicians whose life purpose was the formation of a Neo-Russian school of music. They all labored unceasingly and left their ineradicable mark on the musical life of Russia. Boris is a national music drama in the truest sense. It concerns itself with one of the most sensational episodes of Russian history — one that is familiar to every Russian — and is full of dramatic interest. The period is about 1600 and the story is that of the regent Boris, who, after doing away with the younger brother of the weak heir to the throne, the only obstacle in his path, usurped the crown and ruled for many years, until the false Dmitri appeared, causing him to give way suddenly in a paroxysm of remorse and madness strikingly portrayed in the opera. Moussorgsky was musically not a thoroughly trained artist and his extraordinarily imaginative genius was handicapped by a craftsmanship unequal to the demands upon it. His lifelong friend and associate, Rimsky-Korsakov, undertook a revision of the orchestral score after the composer's death and that is the version now used in performance. The music of Boris has a powerful magic of its own. The composer shows a striking aloofness from the prevailing musical influences of his day and, in his effort to give practical expression to the slogan «Russian music for the Russians,» he even swung, at times, in the direction of musical nihilism; but his music is always vital, original and realistic. Boris has none of the conventional divisions and ensemble numbers of Italian opera, nor the usual distribution of arias. In spite of the commanding figure of Boris and the magnificent monologues which the composer has provided for him, the chief interest is centered in the chorus. The introduction of the third scene suggesting the bells of the Kremlin is strangely prophetic of the music of the ultra-modern French composers. This, and the great choruses in the first, third and last scenes, and the song of the hostess of the Inn, folklike in character, may be singled out as the finest portions of the work. Lewis M. Isaacs.

BORISSOGLEBSK, bō-rē'sō-glĕpsk, Russia, a town in the government of Tambof, 120 miles south of the town of that name, and capital of the government. It has a good harbor which greatly aids its commerce. It has a school for railway mechanics. Through its rail and water connections (canal and river) it ships quantities of grain, lumber, petroleum, fish and caviar to Moscow, Petrograd and other points. It was founded in 1646 as an outpost to hold back the Crimean Tartars.

BORISSOV, bō-rē'sof, Russia, a town in the government of Minsk, 50 miles northeast of the town of that name, on the left bank of the Beresina. Not far from it took place the disastrous passage of the Beresina by the French in 1812. Its principal manufactures are flour and tobacco and there is a large trade in grain and live stock. The town dates from the 12th century and has been in Russian hands since 1795. Pop. 15,000, mostly Jews.

BÖRJESSON, bĕr'ye-son, **Johan,** Swedish poet and dramatist: b. Tanum, 22 March 1790; d. Upsala, 5 May 1866. From 1828 until his death he was pastor of the church of Weckholm near Enköping. His first and best drama 'Erik XIV' (1846; German translation by Winterfeld 1855) was succeeded by others in which Shakespeare's influence is clearly traced. His poems appeared as 'Kärlek och poesi' (1849), and 'Blommor och târar pâ en dotters graf' (1854); his collected works, edited by Dietrichson (Stockholm 1873–74).

BORLAND, Solon, American senator: b. Virginia 1811; d. Texas, 31 Jan. 1864. He was educated in North Carolina, studied medicine and settled in Little Rock, Ark. During the Mexican War he served as major in Yell's cavalry, and was taken prisoner in January 1847. After his discharge in June 1847 he served as a volunteer aide to General Worth until the end of the campaign. After serving in the United States Senate (1848–53), he was appointed Minister to Central America. When returning to the United States after his resignation he was assaulted at San Juan de Nicaragua for interfering to prevent the arrest of a person charged with murder at Puntas Arenas. For this insult the sloop-of-war *Cyane* bombarded and destroyed the town, under instructions from the United States government, 13 July 1854. During the Civil War he was a brigadier in the Confederate service, and before his State seceded, raised troops and seized Fort Smith, by order of Governor Rector, 24 April 1861.

BORLASE, William, English mineralogist and antiquarian: b. Pendeen, Cornwall, 1696; d. 1772. He studied at Oxford, entered orders and became successively rector of Ludgvan and vicar of Saint Just. The richness of Cornwall in mineral products and antiquities gave a direction to his studies, and he began making collections with the view of afterward giving a description of his native county. In 1750 he was elected a fellow of the Royal Society, to which he had communicated a valuable paper on the spars and crystals of the Cornish mines, and for many years after he continued to write in its 'Transactions.' In 1754 he published his 'Antiquities of Cornwall,' and in 1758 he completed the work by publishing his 'Natural History of Cornwall.' He kept up a correspondence with the most eminent men of his day, and was on intimate terms with Pope, whom he furnished with materials for his grotto at Twickenham. Dr. Borlase's name, formed out of crystals, is still to be seen there.

BORMANN, bör'män, **Edwin,** German poet: b. Leipzig, 14 April 1851; d. 1912. He was educated at the Polytechnic Institute of Dresden, and at Leipzig and Bonn. His first success was won by a series of humorous poems in the Saxon dialect which appeared in the *Fliegende Blätter.* In the last 20 years of his life he published several works in support of the Baconian origin of Shakespeare's plays. His other works are in High German;

they include ‹Seid umschlungen, Millionen› (1879); a book of humorous songs, ‹Schelmenlieder› (1883); ‹Das Büchlein von der schwarzen Kunst,› (1886); ‹Liederhort in Sang und Klang› (1888); ‹Klinginsland, Minnelieder und Spielmannsweisen› (1891); ‹Das lustige Buch› (1900); ‹Ut de Franzosentid› (1905).

BORMANN, Eugen, Austrian classicist and epigraphist: b. Vienna 1842. Professor of classical philology, ancient history and epigraphy in Vienna, he is author of ‹Fastorum Civitatis Tauromenitanæ Reliquiæ Descriptæ et Editæ› (1882); ‹Inscriptiones Æmiliæ Etruriæ Umbriæ Latinæ› (1888) and with O. Benndorf of ‹Archäologischepigraphischen Mitteilungen des Oesterreich-Ungarn› (1885). He was associate editor of the monumental ‹Corpus Inscriptionum Latinarum,› and corresponding member of the Imperial Academy of Sciences, Vienna.

BORMIO, bôr′mē-ō (Ger. WORMS, voormz), Italy, town in Lombardy, near the Adda in the province of Sondrio; pop. about 2,000. In its vicinity are the salt baths called Bagni di Bormio, much frequented by tourists. These baths were known to Pliny and the remains of Roman bathing establishments may still be seen. The temperature is 99° 5′. Bormio is distant 20 miles from Tirano, the nearest railway station. General Dessolles achieved here a victory over the Austrians, 26 March 1799. The beautiful galleries of the road which leads over the Wormser Joch (an Alpine mountain), from Tyrol to Italy, were destroyed by the Italians in 1848.

BORN, bôrn, **Bertrand de,** French troubadour and warrior: b. in the Castle of Born, Périgord, 1140; d. about 1209. He dispossessed his brother of his estate, whose part was taken by Richard Cœur de Lion in revenge for De Born's satirical lays. Dante places him in the ‹Inferno› (XXVIII) because his verses intensified the quarrel between Henry II and his sons. There are two editions of his works by Stimming, A. (Halle 1879); Thomas, A. (Toulouse 1888). Consult Diez, ‹Leben und Werke der Troubadours› (Zwickau 1829, pp. 179–233); Barlow, H. C., ‹The Young King and Bertrand de Born› (London 1862); Clédat, ‹Du rôle historique de Bertrand de Born› (Paris 1879).

BORN, Ignaz von, Austrian metallurgical expert and technical author: b. Karlsburg, Transylvania, 1742; d. 1791. He pursued legal studies at Prague but entered the department of mines in 1770 and in 1776 was appointed curator of the imperial mineralogical collections in Vienna. He introduced numerous practical improvements in mining, salt working and chemical bleaching, among others amalgamation for smelting, and cupellating for extracting silver. His principal writings are ‹Lithophylacium Bornianum› (2 vols., 1772–75); ‹Ueber das Anquicken der Erze› (1786); ‹Bergbaukunde› (2 vols., 1789–90).

BÖRNE, ber′ne, **Ludwig,** German political writer and satirist: b. Frankfort-on-the-Main, of Jewish parents (his real name was Lob Baruch), 6 May 1786; d. Paris, 12 Feb. 1837. He founded, and for three years conducted (1819–21), *Die Wage,* a journal devoted to civics, science and art. Of his numerous satirical sketches, all full of humor and wit, these are perhaps the most brilliant: ‹Monograph on the German Postal Snail,› ‹The Art of Becoming an Original Author in Three Days,› ‹Memorial Address to Jean Paul›; and ‹Menzel, the French Devourer› (Franzosenfresser). Fierce animosity toward the dynastic policies of Germany permeated whatever he wrote; even his literary and dramatic criticism was biased by this passion. He and Heinrich Heine were in bitter antagonism. His ‹Complete works,› in 12 volumes, were published in 1863.

BORNEÉNE. See BORNEOL.

BORNEIL, Giraud de, zhē-rō dė bôr-nā-ē, a Provençal troubadour of the 12th century: a native of Exideuil, Dordogne. His contemporaries bestowed on him the sobriquet «Master of Troubadours.» Some 80 of his songs are extant; among them the charming song of the morning, «Alba.»

BORNEMANN, Ferdinand Wilhelm Ludwig, German jurist and peer: b. Berlin 1798; d. 1864. One of the chief authorities on Prussian civil law, he was the author of ‹Systematische Darstellung des preussischen Civilrechts› (6 vols., 1834–39) and of ‹Die Rechtenwicklung in Deutschland und deren Zukunft› (1856). After serving as Minister of Justice in the Camphausen cabinet, and as second president of the Superior Court at Berlin in 1848, the following year he was elected member of the First Chamber of the Prussian Diet and in 1860 of the House of Peers.

BORNEMANN, Wilhelm, vĭl′hĕlm bôr′nẹ-măn, German dialect poet: b. Gardelegen 1766; d. 1851. He is one of the foremost representatives of modern Low German poetry. His works are ‹Low German Poems› (1810), republished in a 10th edition in 1891; ‹Pictures of Nature and the Chase› (1829); ‹Humorous Hunting Songs.›

BORNEO (a corruption of *Burni,* and this from Beruni or Bruni, the capital of the ancient sultanate of Bruni), the great island of the Malay Archipelago, and the second largest island in the world, following New Guinea. It is rudely triangular in outline, with the apex toward the north. It has the Sulu Sea and the Strait of Macassar on the east, the Java Sea on the south, and the South China Sea along the northwest. It lies between 7° N. and 4° 20′ S. lat., the equator crossing it at about its widest part, and so that about two-thirds of its area lies in the northern hemisphere. Its greatest length is about 850 miles, and its greatest width about 600 miles, and its total area is about 290,000 square miles.

Political Divisions.— Having never enjoyed a political entity, the island of Borneo has not had a native name. The title Borneo or Burneï (Bruneï) in fact properly applied only to the Malay kingdom on the northwest coast; and Kalamantan or Kalamantin, sometimes quoted as a general appellation, is also of limited purport. Borneo originally included nearly the whole of the northwest of the island. The Sultan had absolute authority. In 1847 he undertook not to surrender any of his territory to any other power without the sanction of the

British government. Its area was reduced to about 4,000 square miles by the erection of Sarawak, toward the southwest, into a practically independent principality by Sir James Brooke (1841–68), and by the establishment of the British North Borneo Company as a recognized governing body. The company's charter, granted in 1881, transferred to them rights originally obtained by an American in 1865, and they successfully appropriated and developed on the northeast of Bruneï a territory having an area of 31,106 square miles, with a coast line of 900 miles. This is now divided into the East Coast Residency and the provinces of Dent, Keppel and Alcock, and has its capital at Elopura or Sandakan, the largest settlement, with 5,000 inhabitants. Sarawak has an area of about 42,000 square miles, and a mixed population numbering about 500,000. The three states, British North Borneo, Bruneï and Sarawak are under British government or protectorate and constitute British Borneo. They comprise about one-fourth of the total area of the island. The remaining three-fourths — about 212,737 square miles — is ruled directly or indirectly by the Dutch, who have divided it into the residency of the Western division of Borneo, with a population of 450,930, and that of the Southern and Eastern Borneo, with a combined population of 782,722, the former having Pontianak as the seat of government, the latter Banjermassin. Besides a number of smaller dependencies, the western division contains the kingdom of Landak, Tayan, Mampawa, Sukadana, Simpang, Matan, Sekadow, Sintang and Sambas. Among the separate states which go to form the southern and eastern divisions are Kotaringin, Banjermassin and Martapura. In consequence of a decree of the Sultan of Banjermassin, the district watered by the Great Dyak or Kahayan is preserved for the native tribes, who in 1879 were estimated at 18,000 souls; Chinese, Malays, etc., are forbidden to ascend the river higher than the Kanpore Pilany. The same is the case with the basins of the Kapuas, Mururg, known as the Little Dyak district. The population of the whole of the Dutch portion of the island is estimated at 1,280,000, of whom about 1,600 are Europeans, 56,000 Chinese, 3,300 Arabs and miscellaneous Orientals. Among the so-called natives are included from 200,000 to 300,000 Malays settled along the coast, who used, formerly, to be counted among the strangers. The island of Labuan, off the coast of Bruneï, has belonged to the British since 1846.

Topography.— Although the neighboring islands are distinctly of volcanic origin, Borneo consists of ancient igneous rock masses, showing small traces of volcanic activity. With the exception of Kina Balu (13,700 feet), the principal mountains form several massive chains with here and there a peak rising to nearly 10,000 feet above the sea level, the elevations diminishing toward the southward. Chief among these is the Tibang-Iran chain which constitutes the backbone of the island, ranging irregularly southwestward through its northern half, and continued south of the equator by the Schwaner range. Batu-Tibang (9,800 feet) is the highest peak of the former, and 5,300 feet is the highest elevation found in the latter. A second chain crosses the island from east to west about 60 miles north of the equator. These two chains practically divide the island into four main watersheds. The northwestern basin constitutes the territory of British Borneo. The other three basins comprise Dutch Borneo. In almost all sections of the island the land along the coast line is a low swampy belt, made up of the alluvial wash of the central highlands. This belt is from 10 to 50 miles in width, the larger extensions being found in the southern section, and upon the southerly portion of the east coast. Between the swampy coast lands and the interior heights lies an irregular zone of hill country with an average elevation of 1,000 feet above the sea, and having occasional peaks rising to 5,000 and even 6,000 feet. These uplands are of blue metamorphic limestone overlaid by a thick series of sandstones, conglomerates and clay shales. Piercing these are dykes of granite and porphyry. The upper layers have, in many places, been worn away, leaving exposed solitary crags of limestone. It is believed that up to a recent period of geologic time Borneo was a part of the mainland of Asia. This theory receives confirmation in the fauna of the island, which includes many species of Asiatic animals, notably the rhinoceros, the elephant, certain wild cattle, several species of deer and swine, the tiger cat and civet cat, with others of the cat tribe, the small black bear, the scaly anteater, several Asiatic lemurs and monkeys, and of greater significance than all, two of the anthropoid apes — the gibbon and the orang-outang. The prevalence of volcanic activity past and present in the archipelago offers a highly probable explanation of a subsidence which carried down the connecting country, of which Java and Sumatra also were highlands. It has been established that these three islands rest upon a submarine bank about 500 to 600 feet below the present sea level, and a little east of Borneo the sea bottom plunges down abruptly to a great depth. It is evident that before the alluvial plains were formed, Borneo must have presented an outline not unlike that of Celebes and Gilolo, a group of peninsulas radiating from the central highland.

Borneo is the best watered country in the world; on every side there are numerous rivers with abundant flow. Most of them, however, are partially obstructed by mudbanks and stranded tree-trunks and they carry a heavy burden of silt, which is deposited in great deltas at the sea line, thus continually extending the alluvial swamps which border the island. Owing to the great width at their mouths some of the rivers have tidal bores which heap up bars and shoals at the entrances from the ocean. The largest river of British Borneo (the northwestern basin) is the Rejang, navigable by small steamers for 170 miles. It issues into the sea by five mouths, forming with the Igan a delta covering 1,200 square miles. In the southwestern section is the Kapuas River, longer than the Rejang and with a delta 70 miles across. In the southeastern basin the largest river is the Barito: in the rainy season the delta of this river covers 11,000 square miles. In the eastern basin the most important river is the Koti or Mahakkan, also with an extensive delta. Nearly all of the 40 rivers which empty into the sea are navigable for many miles with vessels drawing not more than 12 feet of water. As far up as the foothills the rivers are practically without current, but in the hilly section they are a succession of great rapids and cataracts. Above this first barrier, however, in many cases there are long stretches of sluggish water available for local navigation. There are many lakes in the numerous valleys, but none remarkable for unusual size. The great Kina Balu lake of the early explorers, if it ever existed, cannot now be found.

Climate.— The climate of the whole island is warm and humid and very equable. Snow is sometimes seen upon the tops of the highest mountains. The rainfall is very abundant throughout the year, but somewhat heavier from October to February and least during April and May. The maximum record has been 225 inches and the minimum 102 inches, with 160 inches as the average. The largest month's record is 69 inches and the largest day's record 15 inches. Thunder storms are frequent and of great severity, but wind storms are rare. The temperature ranges normally between 72° and 93° F., occasionally reaching 100°, but the heat is tempered by the sea breezes, which, however, do not penetrate the forests. The continuous heat and moisture promote the decomposition of the vegetable débris in the marshes and forests, with the production of poisonous miasmas, rendering many parts of the island very unhealthful, particularly for white men.

Population.— The population of the entire island numbers about 1,845,000 according to conservative estimates — there has never been a census. Of the whole, only about 3,500 are Europeans. The bulk of the population consists of three classes, the Dyaks or Dayaks, who are the aboriginal heathen inhabitants and constitute the great majority; the Mohammedans or Malays — for this name is extended so as to include all professors of Islam, whether true Malays, Buginese, Javanese, Dyaks, or Arabs; and the Chinese. The Dyaks are of two groups; those of the coast country and those of the interior. The former have a strong admixture of Malay blood with some Chinese and Buginese strains. They are less nomadic in character than the purer race of the interior and carry on a certain amount of trading with the coast dwelling Malays with whom they fraternize. They are energetic and successful fishermen. The Dyaks of the interior employ themselves with hunting and tillage, and the collecting of gutta-percha, rubber, resin, gums, rattans, gold dust and wax. They are diveded into numerous tribes. The pure Dyak has a physique superior to the Malay races. They have regular features skin of a clear yellow tint, a flat nose and prominent lips. While some of the coast Dyaks have become Mohammedans, those of the interior have a peculiar religion which includes a supreme creative spirit and a multitude of evil spirits. They regard all animated nature as souls with a mortal envelope. The practice of head-hunting has been subdued in the coast dwellers, but still exists in the interior. The Malays (taking the name ethnographically) dwell on the coast, are traders and bold sailors. They are more civilized than the Dyaks, cultivate the grounds around their houses, lay out gardens, keep cattle and live partly by fishing. The Chinese, chiefly from Canton, have penetrated far into the interior. They engage in trade and mining, are unwearied in their efforts to make money, and then return to their native country. They have always endeavored to live as independent communities (*kong-si*) under chiefs chosen by themselves, and according to Chinese laws. In 1857 the Chinese living in Sarawak rebelled, and were nearly exterminated. The Dutch were also compelled to put them down by force of arms, and have imposed a poll tax. The women of Borneo, except the Dyak, weave cotton fabrics, make earthenware, baskets and mats of beautiful designs and colors. In the district of Banjermassin are factories of weapons. The principal exports are gold, gold dust, diamonds, coal, petroleum, rattans, rubber, edible nests, wax, timber, dyewoods, mats, resins, sandalwood, camphor, cutch, copra, dried fish, sago flour, trepang, gambier, etc.; the imports, earthenware, iron, steel and copper work, piece-goods, yarns, woolen and silk fabrics, medicines, provisions, wines, spirits, rice, flour, sugar, tea, tobacco, opium, gunpowder, etc. There is one railway in Borneo, running out of Bruneï. With its branches it extends about 130 miles. Practically all transportation is carried on by boats.

Products.— Practically the whole of Borneo, even the tops of the highest mountains, is covered with dense forests standing, for the most part, in carpets of thick moss. On the lower levels the trees reach to heights of 150 to 200 feet; on the highest mountains they are somewhat stunted. Nearly 500 distinct species of trees have been recognized, and many of them yield valuable timber. Some varieties are so hard and close-grained that they will not float in water. Among the most important of the forest products are ironwood, bilian, teak, ebony, sandalwood, gutta-percha, dyewoods, benzoin, wax, dragon's-blood, sago, rattans, various resins, oil nuts and gums. The camphor of Bruneï is the best in Asia. The mohor-tree, well adapted for making native boats, attains a height of 80 feet, and the kaladang, suited for large masts, of 200 feet. Nutmegs, cloves, cinnamon, pepper, betel, ginger, rice, millet, sweet potatoes, yams, cotton in Amuntai, sugar-cane in Sambas and Montrado, indigo, tobacco, coffee in Sambas, pineapples, cocoanuts, etc., are cultivated. The mountains and forests contain many monkeys, among which is the orang-outang. Tapirs, a small kind of tiger, small Malay bears, swine, wild oxen or banteng and various kinds of deer abound, and panthers are very numerous. The flying fox and flying squirrel are plentiful. The elephant is found only in the north and the rhinoceros in the northwest. The rhinoceros and wild cattle, however, have nearly disappeared and the orang-outang would be extinct if it were not for government protection. The few domesticated animals are water buffaloes, sheep, goats, dogs and cats. A few horses are seen in Banjermassin. Among the birds are eagles, vultures, argus pheasants, peacocks, flamingoes, pigeons, parrots, and also the swifts (*Collocalia esculenta*) which construct the edible nests prized by the Chinese for making soup. The rivers, lakes, and lagoons swarm with crocodiles, and many kinds of snakes, including a 20-foot python, frogs, lizards and leeches. Fish is plentiful, including mackerel, herring, barbel, soles, mullet, crabs and shrimp, and the coasts are rich in tortoises, pearl mussels, oysters, and trepang. Brilliant butterflies and moths are in great variety, and swarms of mosquitoes and sting flies. Ants, scorpions and centipedes abound, and the jungles are noted for the din created by the multitudes of noisy insects and frogs. Among the mineral products are bituminous coal, gold and copper, especially in Montrado; large quantities of antimony, iron, tin, platina, nickel, arsenic, mercury, diamonds and other precious stones, rock crystals, porcelain clay, petroleum of good quality and sulphur. The diamond mines are chiefly in Landak and Pontianak; Sambas produces the greatest quantity of gold; the kingdom of Bruneï, Kuteï and Banjermassin, the largest amount of coal. The Pengaron coal field worked by the Dutch government, is one of the most important.

History.— Borneo was engaged in commerce with China as early as the 5th century, but it is not certain that the Chinese had settlements there until the 12th century. The Malay kingdom of Borneo proper dates back to the 13th century. Later, Bruneï and the Sulu Islands were joined under one sultan who was first resident at Bruneï, and afterward at Sulu. Another Malay settlement of later origin, Sambas, was at first dependent on Johore in the Malay Peninsula. Sukadana was founded by Hindu Javanese from the kingdom of Majapahit (see JAVA) and spread its influence on the whole southern part of the west coast. Mampawa was a Buginese settlement, and Pontianak was founded as late at 1771 by a colony of Arabs, Malays and Buginese. Islam began to be preached by Arabs from Palembang in the 16th century.

The Spaniards first visited Borneo in 1521 landing at Bruneï, and in 1576 sent an armed force to take possession of that kingdom. The Portuguese came in 1526, and after 1530 kept up regular communication with Bruneï for many years. In 1609 they effected a settlement at Banjermassin; from thence they were, however, soon expelled. The Dutch succeeded in concluding a treaty of commerce with the princes of Banjermassin. They erected a fort and factory in 1643, and a second in 1778 at Pontianak. They resumed attempts at colonization in 1816, meeting the opposition of the Chinese who had established themselves near the mines of Landak and Montrado on the east coast. A war finally ensued (1853–56) resulting in victory for the Dutch, who gradually extended their possessions by conquest and treaty. The British made unsuccessful attempts in 1702 and 1774 to effect a settlement in Borneo, but during the 19th century they acquired a preponderating influence on the northwest coast. They drove off the Spaniards and for some time disputed with the Dutch for exclusive possession of the island. The struggle ended in 1892 with an agreement which divided the island according to the boundaries which now obtain.

BRITISH NORTH BORNEO.

British North Borneo comprises the northern tip of the island of Borneo — a triangular area of about 31,100 square miles. Along its base it has Bruneï on the southwest and the eastern division of Dutch Borneo on the southeast. A large part of the terrain is covered with jungle, but the interior is mountainous and includes the highest land on the island. The population was officially estimated in 1911 at 208,183, of which 26,000 were Chinese, 5,700 Filipinos, 5,500 East Indians, 1,600 Malays and 355 Europeans. Of the 170,000 natives, the Dusuns numbered about 88,000; the Muruts, 25,300, and the Bajaus, 22,600. The chief town is Sandaken, with a population of about 6,000. The territory is under the jurisdiction of the British North Borneo Company, and is held under grants from the Sultans of Bruneï and Sulu. It is administered by a governor resident in Borneo and a council of directors in London. Since 1888 the state has been under a protectorate of the British government. For purposes of administration the territory is divided into five residencies, and these are subdivided into districts, each controlled by a justice of the court.

A railway 130 miles in length runs from a point on Bruneï Bay northward along the coast for a short distance and then into the interior. There are a telegraph line and several wireless stations. Most of the trading is carried on through Singapore and Hongkong. The annual tonnage of shipping entering the ports of the territory is about 290,000. For the year 1915 exports amounted to $4,109,425, and imports to $2,488,785. The exports were principally: rubber, $1,306,771; tobacco, $1,311,234; timber, $461,925; coal, $184,096; cutch, $163,410; fish, $121,756; gum damar, $78,279; copra, $49,835; rattan, $49,258; birds' nests, $43,877, and camphor, $30,453. The chief imports were: rice, flour and grain, $621,063; cloth, $283,190; provisions, $202,862; treasure, $201,384; ironware, $126,630; tobacco, $107,501; machinery and vessels, $103,631; spirits and wine, $93,280; sugar, $85,690; opium, $65,956, and kerosene oil, $63,693. A very small amount of the foreign trade of Borneo reaches the United States: in 1915 the value of such exports was $17,364. To the Philippines the exports were valued at $58,277. Mail to or from the United States via Hongkong requires one month for transit; if via Singapore, two months.

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BORNEOL, or **BORNEO CAMPHOR,** a crystalline organic compound, often used as a substitute for common or laurel camphor. Borneol is obtained from a tree indigenous to Sumatra, Borneo and Labuan, being deposited in crystals in cracks in the wood. To obtain it the tree is cut down and the longitudinal fissures are opened and the camphor removed. Large trees often yield from three to 11 pounds; and owing to the reckless manner in which the trees have been destroyed without the planting of others, the Sumatran forests now contain few that are worth working. Borneol has the chemical formula $C_{10}H_{17}.OH$, and it may be prepared from common camphor by the action of reducing agents. It is not so volatile as common camphor, and is also harder. It is but slightly soluble in water, although it dissolves freely in alcohol and ether. When distilled with phosphorus pentoxide, borneol is converted into one or more terpenes, prominent among which is borneo-camphene or borneëne ($C_{10}H_{18}$). Pure borneol sinks in water, while common camphor floats.

BORNET, bor′nāē, **Jean Baptiste Edouard,** French marine botanist: b. Guérigny, Nièvre, 1828; d. 1912. After studying medicine and botany in Paris, he went to Cherbourg with Thuret where they interested themselves chiefly in the study of marine algæ. His principal works, some in collaboration with Thuret, are ‹Recherches sur la structure de l'éphèbe pubescens› (1852); ‹Recherches sur la fécondation des Floridées› (1867); Recherches sur les gonidies des Lichens› (1873); ‹Notes algologiques, récueil d'observations sur les Algues› (1876–80); ‹Les algues de Schonsboe› (1892), and in collaboration with Flahault, ‹Revision des Nostocacées hétérocystées› (1886–88).

BORNHOLM, a Danish island in the Baltic Sea, nearly surrounded with rocks; situated in lat. 55° 10′ N.; long. 15° E.; about 24 miles long and 16 broad; pop. 41,364. It is stony but fertile; yields oats and butter; has excellent pastures; and also mines of coal, marble quarries and fisheries. The island has long been famous for its rock-crystals. The capital, Rönne, on the west coast has over 8,000 population, and is connected by a railroad 22 miles long with Nekso on the eastern coast. It fell into Danish possession about 1000 A.D., but was taken by Lübeck in the 16th century, and finally regained by Denmark in 1660.

BORNIER, bôr-nē-ā, **Henri** (VISCOMTE DE), French dramatist: b. Lunel, 25 Dec. 1825; d. Paris 1901. He was educated at Montpellier and came to Paris to enter on the study of law. He published ‹Premières feuilles› about 1845, and his play, ‹Le mariage de Luther,› was accepted by the Comédie Française in the same year. He soon after began his long connection with the Bibliothèque de l'Arsenal, becoming its administrator in 1889. In 1893 he became an Academician. His plays are notable for splendor of diction. They include ‹Le monde renversé› (1853); ‹Dante et Béatrice› (1853); ‹Agamemnon› (1868); ‹La fille de Roland› (1875); ‹L'apôtre› (1881); ‹Mahomet› (1890); ‹Le fils de l'Arétin› (1895). He also is the author of several successful novels and romances and numerous poems.

BORNITE, a native sulphide of copper and iron, containing these metals in various proportions. The mineral crystallizes in the isometric system, and its crystals have the formula $3Cu_2S.Fe_2S_3$. It is reddish brown in color when freshly broken, but speedily takes an iridescent tarnish. Its hardness is 3, and its specific gravity from 4.9 to 5.4. The massive varieties contain from 50 to 70 per cent of copper, and the mineral constitutes a valuable ore of that metal. Bornite occurs abundantly in a copper-mine at Bristol, Conn. Bornite occurs in many western copper mines, as at Butte, Mont., and in Colorado, being at times highly argentiferous. It abounds in Chile, Peru, Mexico, Canada and many other countries.

BORNOU, or **BORNU,** formerly a Sudanese kingdom. The native independent state had an area of about 50,000 square miles, one portion of which is now included in northern Nigeria (British) and other portions to Germany and France; lying between lat. 10° and 15° N., and long. 12° and 16° 30′ E. From March to July the heat is extreme, the thermometer rising to 107° and rarely falling below 86° F.; during this time scorching winds from the south prevail. As in other tropical countries the seasons are divided into the dry and rainy: the latter continues from March to October, when the air becomes milder and fresher. The country is populous, containing 13 principal towns. These are generally large and well built, with walls 40 feet high and about 20 feet thick. The houses consist of several courtyards, with apartments for slaves, habitations for the different wives and several turrets connected by terraces, forming the apartments of the owner. The Bornou people, or Kanuri, have negro features; they are peaceable and industrious, practising agriculture and various mechanical arts. The government is an absolute monarchy, with certain constitutional forms, and the Sultan of Mai can, it is said, muster a well-equipped army of 25,000 or 30,000 men, partly cavalry, armed with musket, rifle, sabre, etc. Indian corn, cotton and indigo are the most valuable productions of the soil. Fruits and vegetables are also raised. The domestic animals are asses, camels, horses, dogs, sheep, goats and oxen. Lions, leopards, hyenas, jackals, elephants and buffaloes roam the forests. The crocodile and hippopotamus are considered a luxury. The ostrich, pelican, crane and guinea-fowl abound. Locusts often appear in great clouds, and are eaten by the natives. The capital until 1908 was Kuka, near the shore of Lake Chad. Its population is about 60,000. The present capital is Maidugari, where the Sheku, or native ruler resides. In the 12th century Bornou was invaded by the Mohammedans, and a fierce struggle ensued for 200 years in which the natives were brought completely under the Moslem yoke. The kingdom prospered and reached its greatest degree of expansion toward the close of the 16th century, after which a decline set in. The Fellatahs conquered it early in the 19th century, but were expelled by Mohammed el Kanemi, who set up his government at Kuka, and took the title of Sheik. His son Omar succeeded him and he in turn was succeeded by Abu Bekr in 1882. Barth, Nachtigal and other travelers are about the sole sources of our information of Bornou and its people. Pop. about 5,000,000.

BORO BUDDOR, bō-rō bood-ôr, or **BÔRÔ-BOUDOUR** (the «Great Buddha»), the ruin of a temple in Java, near the junction of the Ello and Progo, the most elaborate monument of the Buddhist style of architecture anywhere existing. Javanese chronicles assign the building to the 7th century, but these documents were composed long after the events described and are to a large extent fictitious. Dr. C. Leemans, in his valuable ‹Bôrô-Boudour dans l'Isle de Java› (Leide 1874), expressed the view that the construction of this temple falls «in the 9th, perhaps even the 8th century, after

Christ.» It rises from a low hill between four vast volcanoes which supplied the blocks of trachyte of which the edifice is built; its height to the cupola is 118 feet. It is a pyramid of a square form, each side at the base measuring 600 feet, and consists of seven walls, which are built like the steps of a stair, up a hill. Between the walls are narrow terraces running round the building; in each is an arched doorway leading to the next higher terrace. These walls are richly ornamented with statuary. Outside are over 400 niches topped with fantastic domes, and each occupied by a large statue of Buddha. Between each of these are bas-reliefs, including figures of the god seated, and architectural ornaments and carvings of all sorts. Below the niches, on the lower story, is an immense bas-relief running round the whole building, representing scenes from the life of Buddha and religious subjects. The inner faces of the building are also profusely ornamented with bas-reliefs, representing battles, sea-fights, processions and chariot races, carried to an extent unrivaled by any other building in the world. Of the large reliefs alone there are over 2,000; and most of them are as vigorously designed as they are carefully executed. Within the upper square terrace are three circular ones, the outer ornamented with 32, the next with 24 and the upper with 16 small bell-shaped shrines (*dagops*), each containing a seated statue of Buddha, which can be seen through the open works of their roofs. The whole is surmounted by a cupola, the principal and probably the most ancient part of the structure. It is now empty, a sunken chamber, 10 feet deep, representing what was, no doubt, a *dogop* intended to contain the precious relic for which this splendid temple was erected. The niches containing the cross-legged figures have been supposed to be a copy, in durable architecture, of the cells of a Buddhist monastery, each occupied by a shaven priest; the cupola is rather to be classified with the topes or stupas of Afghanistan. The structure is thus a compound of a tope with a copy, in durable architecture, of the frail cells of a vihara.

BORODIN, bŏ-rō'dĕn, **Alexander Porfiryevich,** Russian composer: b. Saint Petersburg, 12 Nov. 1834; d. there, 27 Feb. 1887. He studied medicine and chemistry and was made professor of chemistry at the Medico-Surgical Academy of Saint Petersburg and in that capacity took a prominent part in promoting the higher education of women and gave them gratuitous instruction in medicine. He was at the same time an excellent musician, one of the chief representatives of the new Russian school. His chief works are two symphonies and ‹In Central Asia,› «a musical picture,» and the most widely popular of his works. His opera, ‹Prince Igor,› which he had not completed at his death, was finished by Rimsky-Korsakoff and Glazounoff, and was brought out in Saint Petersburg in November 1890. An English translation by R. Newmarch of his ‹Life› by Habets appeared in 1897.

BORODINO, bŏ-rō-dē'nō, Russia, village 70 miles west of Moscow, on the Kaluga, an affluent of the Moskwa. It gave name to the great battle fought between the French army under Napoleon and the Russians under Kutusoff, 7 Sept. 1812. The battle of Borodino was one of the most obstinately disputed in history and the loss on both sides was almost equally great. Out of 257,000 men engaged, between 70,000 and 80,00 were killed and wounded. The Russians retreated on the following day, but in the most perfect order, and therefore claim this battle as a victory and in 1839 erected a splendid mausoleum on the battlefield. The French, who name the battle from the Moskwa, have always maintained a similar claim, which it is difficult to deny them as they took possession of the battlefield and subsequently advanced on Moscow. Marshal Ney received the title of Prince of Moskwa. For a good description of the battle consult Tolstoi's ‹War and Peace› (Eng. trans. by Leo Wiener).

BOROGLYCERIDE, or **BORO-GLYCERINE,** -glis'- (from «boron» and «glycerine»), an antiseptic substance, soluble in alcohol and in 40 parts of water and containing about 25 per cent of borate of glycerine ($C_3H_5BO_3$), the remaining 75 per cent consisting of free boracic acid and glycerine in equivalent proportions. It is prepared by heating together 92 parts of glycerine with 62 parts of boracic acid at a temperature of 360° F. Boroglyceride is considered harmless and is used in the preservation of fruits and wines and other articles of food.

BORON (from «borax»), one of the non-metallic elements. In nature it is never found in the uncombined or elementary state, though it occurs abundantly in combination with other elements, especially in regions that are or have been volcanic. The principal compounds of it that are found in nature are borax and boracic acid (qq.v.). It is a constituent of numerous other minerals, but most of these have but little commercial importance. Boron was first obtained in the elementary state about the year 1808 by Gay-Lussac and Thénard in France and by Sir Humphry Davy in England. Gay-Lussac and Thénard prepared the element by heating boracic acid very strongly until all its water was expelled and then heating the resulting substance (now known as boric oxid) with metallic potassium. The potassium removed the oxygen from the boric oxid, setting the element boron free. When thus prepared boron is an opaque amorphous powder of a greenish-brown color. It has neither taste nor odor, but it stains the fingers strongly. Owing to its finely divided condition it is apt to take fire spontaneously; but if it is consolidated by pressure it is not affected by the air at common temperatures, though it burns with a reddish light when heated. It is not affected by water save that water will dissolve a slight amount of it when it is freshly prepared. Strong nitric acid will dissolve it in the cold and hot sulphuric acid attacks it also. It is one of the few substances that will combine directly with nitrogen, which it does when heated in that gas. The atomic weight of boron has not been determined with satisfactory precision, but Clarke gives 10.97 as the best result obtainable from the existing data. The amorphous boron described above is soluble in melted aluminum, from which it crystallizes out on cooling. The crystals so obtained were formerly thought to consist of pure boron, but it has been shown that they always contain a definite amount of aluminum. These crystals may be obtained of such hardness that they will scratch both corundum and the ruby, the diamond being the only substance that exceeds them in this respect. The specific gravity of amorphous boron has not been satisfactorily determined, but it appears to exceed 1.84. The specific gravity of the crystals obtained as described above is said by Miller to be 2.68. The specific heat of boron varies considerably with the temperature. At 250° C. it is .37 and at 1,000° C. it is probably 0.5. Boron is a non-conductor of electricity.

BORORÓS, bō-rō-rōs', a tribe of South American Indians of the Tupi or Guarani stock, variously reported from a few hundred to a thousand, living in southwestern Brazil around the headwaters of the Parana and Paraguay, the small remnants of a once powerful race, thinned by old Portuguese slave raids and disease. They live in villages and do some planting, but live mainly by hunting with long bows and bone-tipped arrows. They are exceptionally tall, averaging over five feet eight inches, and athletic, and are reported to practice both polygamy and polyandry, but little is really known of them. Their language is of the Otuquian family. Consult Fric and Radin, in the *Journal of the Royal Anthropological Institute* (1906); Chamberlain, in the *American Anthropologist* (1912); also ‹I Bororos-Coroadosdel Matto› by the Salesian missionaries (Turin 1906); Cook, in ‹Miscellaneous Collections› (of the Smithsonian Institute, Vol. V, p. 50, Washington 1907).

BOROUGH, in England, either an incorporated municipality with an organized government and a charter of special privileges (municipal borough), or a district which, either by itself or in conjunction with other boroughs, returns a member of Parliament (parliamentary borough). The *burh* (hill) was originally a hill-fort; then the settlement around it, with its own court, and head officer called a «port-reeve.» Under the Norman kings the port-reeves were replaced by royal officers and the boroughs gradually received special charters and were governed by their leading guilds. As their support came to be needed by the governing factions they were given representation in Parliament; and under the Tudors, especially Mary, small boroughs in great profusion were created expressly to return members in the government interest. This practice was put a stop to under Elizabeth. Besides these many of the older boroughs decayed till they had little or no population, but were allowed to retain their parliamentary power to strengthen the aristocratic and land-owning interest, the proprietors of the sites returning whom they chose: these were called «rotten boroughs,» and the chief was «Old Sarum» (that is, Old Salisbury), with not a single inhabitant but two members of Parliament. Others had only one. Those somewhat larger, but still so small as to be at the dictation of some one person or family, were called «pocket boroughs.» The Reform Bill of 1832 swept away the worst of these anomalies.

In the United States the term is now restricted to certain incorporated villages below the rank of cities in four States — Connecticut, New Jersey, Minnesota and Pennsylvania; and is practically synonymous with «town» in most other States and with «village» in Ohio. At the beginning of colonization the natural idea was to transplant the English borough system to America; but the conditions of settlement and government made it generally inapplicable. In Virginia the term was applied in the sense of «parliamentary borough,» to districts made up of hundreds and plantations, having representation in the house of burgesses, of which in 1619 there were 11; but the municipal borough did not take root there. Lord Baltimore and William Penn were empowered to establish the latter in their colonies of Maryland and Pennsylvania; but the former did not avail himself of it at all and the latter very little, nor his heirs after him. After the Revolution, however, the Pennsylvania legislature granted special borough charters freely and in 1834 passed an act empowering courts of quarter sessions to grant them; in 1851 a general act for their creation and regulation was passed. In New Jersey they were created by special charters as early as the beginning of the 18th century and in 1818 a general act was passed. In Connecticut they have always been created by the legislature in special acts. In Minnesota and Pennsylvania the boundaries of the borough are conterminous with the township, forming one of the primary county divisions: in Connecticut and New Jersey the borough is only a village government within a town, which in all cases is a separate body including the borough; the latter being only the thickly settled portion within the range generally of the postal, fire, etc., departments and governed by a warden and burgesses, corresponding to the mayor and single-chamber council of a city.

A still further extension was given to the term by the New York legislature in 1897, when the city of Greater New York was constituted of five «boroughs» — Manhattan, Brooklyn, Queens, The Bronx and Richmond. See BURGH.

BOROUGH-ENGLISH, in law, a mode of descent in some ancient parishes and manors, in which the owner's youngest son, or his youngest brother (if he has no issue), is the heir. A posthumous son was entitled to this privilege and dispossessed his elder brother. One reason assigned for it is that the youngest son, on account of his tender age, is not so able to take care of himself as his elder brothers; while Blackstone derives it from the usages of pastoral life, where the youngest son remained to look after the household. Its origin is much disputed, but may be a custom of Saxon origin and so named to distinguish it from the Norman customs. It still holds in a few places.

BOROWSKI, bo-rof'ski, **Felix,** American musician, composer and critic: b. Burton, England, 10 March 1872. His father, a Pole, taught him piano and violin and he completed his studies at the Conservatory of Cologne. He taught four years in Aberdeen and three years in London, from 1890 to 1897, and in the latter year came to the United States and settled in

Chicago. While acting as professor of composition in the Chicago College of Music he became musical critic of the Chicago *Evening Post* and after 1908 wrote the analytical programs for the Theodore Thomas orchestral concerts. He joined the staff of the Chicago *Record-Herald* in 1909. His compositions include numerous works for violin, piano, organ, songs, two orchestral suites, a 'Marche Triomphale' and 'Eugene Onegin,' a symphonic poem.

BORROMEAN (bŏ-rō-mā'an) **ISLANDS,** four small islands in a bay of Lago Maggiore, north Italy, and named after the Borromeo family, and named respectively Isola Bella, Isola Madre, Isola dei Pescatori and L'Isolino. The Isola Madre lies farthest from the shore of the lake. It is laid out in seven terraces, rising one above the other, with charming walks and a mansion on the top. The Isola Bella contains a handsome and extensive palace, with private chapel and picture gallery, the fine gardens adjoining being laid out upon 10 terraces rising above each other. The island was formerly little more than a barren rock and much soil required to be brought from the mainland. The Isola dei Pescatori is mostly occupied by a fishing village. Magnificent views of the surrounding scenery are obtained from these islands. Pop. 300.

BORROMEO, bŏ-rō-mā'o, **Carlo** (COUNT), saint and cardinal of the Roman Catholic Church: b. Arona, Italy, 2 Oct. 1538; d. 3 Nov. 1584. He came from an illustrious family, his father being Count of Arona and his mother a Medici. He studied law at Pavia; was in 1559 made doctor, and in 1560 was successively appointed by his uncle Pius IV apostolical prothonotary, referendary, cardinal and archbishop of Milan. As legate over Romagna, the March of Ancona and Bologna, he had a great share in the civil government: as protector of Portugal, of the Netherlands of Switzerland, of the Franciscans, Carmelites and of the Knights of Malta, he administered several important branches of the spiritual government of the Pope, who created him his grand penitentiary, and did nothing of importance without his advice. The reopening and the results of the Council of Trent, so advantageous to the papal authority, were chiefly effected by the great influence of Borromeo and he took a principal part in drawing up the celebrated 'Catechismus Romanus.' He did much for the embellishment of the papal buildings, employing even his own fortune for that purpose, and established many excellent institutions as archbishop of Milan. His rigid morality and determination to maintain ecclesiastical discipline drew on him the hostility of the monastic orders, and in 1569 a wretch of the order of the Umiliati shot at him while the archbishop was at prayer in his chapel. He founded in 1570 the Helvetic College in Milan for the training of priests for the conversion of Switzerland, and formed an alliance of the seven Catholic cantons known as the Golden Borromean League. He may also be regarded as the founder of the modern Sunday school; established schools, seminaries, an order of secular priests (oblates), libraries and hospitals and was indefatigable in doing good. During the pestilence which raged in Milan in 1576 he distinguished himself by his heroic devotion to his flock. As soon as the scourge appeared in the city he hastened from a distant part of the diocese, where he was making a pastoral visitation, and spent all his energies in giving bodily aid and spiritual consolation to the plague-stricken inhabitants. All his virtues, however, could not save him from persecution and calumny; he was severely attacked by the government for vindicating the rights of the Church, but no charge could be proved against him. Miracles were said to have been wrought at his tomb immediately after his death, and his canonization took place in 1610.

A colossal statue to his memory was raised in 1697 near his birthplace on the west bank of the Lago Maggiore. Consult 'Lives' by Stackpole-Kenney (1911), Sylvain (1884), and Thompson (1893); also, Cantono, 'Un grande reformatore del secolo XVI' (Florence 1904).

BORROMEO, Federigo (COUNT), cardinal and archbishop of Milan, nephew of Saint Charles: b. Milan 1564; d. 2 Sept. 1631. He founded the Ambrosian Library at Milan in 1609, and devoted to it most of his fortune. He sent emissaries to several countries to collect manuscripts for it. He added to it a printing establishment, and founded academies, schools and charitable institutions. When Milan was desolated by a pestilence in 1630, Federigo showed the same heroism as his uncle Carlo had done during that of 1576.

BORROMINI, bŏr-rō-mē'nē, **Francesco,** Italian architect: b. Bissone 1599; d. 1667. He studied sculpture in Milan and architecture in Rome under Maderno, architect of Saint Peter's. After Maderno's death he was a pupil of Bernini, by whom he was employed on various parts of Saint Peter's. He built the church of San Ivo alla Sapienza, the oratory and cloister of San Filippo Neri, the façade of the church of Santa Agnese in the Piazza Navona and the interior of San Giovanni in Laterano. He was one of the chief representatives of the baroque style. Borromini conceived an unreasoning hatred for his instructor Berini and determined to surpass him in his art, but maddened by the latter's success he committed suicide.

BORROW, George, English traveler, linguist and writer on gypsy life: b. East Dereham, Norfolk, 1803; d. Oulton Broad, Suffolk, August 1881. On his father's side he was descended from a Cornish family, and his mother was of Norman extraction. His father was a recruiting officer, who was constantly changing his residence, and thus Borrow's early years were passed in various parts of the United Kingdom. He received part of his education in Edinburgh High School, and in 1820 was articled to a Norwich solicitor. It was about this time that he laid the foundation of his linguistic knowledge (he attained proficiency in 20 languages) under the guidance of William Taylor, a friend of Southey. After his father's death he went to London, where he lodged in the same house as Benjamin Disraeli, and earned his livelihood by literary hackwork and edited the Newgate *Calendar;* but, soon tiring of this, he set out on a series of journeys through England, France, Germany, Russia and other countries, acting latterly as agent of the

British and Foreign Bible Society and making gypsy life and customs a special study. During the seven years or so prior to his engagement by the Bible Society he seems to have suffered great privations, but of his movements at that time he has told us nothing. He married in 1840 and settled on a small estate of his wife's at Oulton Broad, in the northeast of Suffolk, where he died. He maintained to the last his strong sympathy for gypsy life, and not only permitted but encouraged the gypsies to encamp on his estate. His best-known work is 'The Bible in Spain' (3 vols., 1843); and his other publications include 'Targum: or, Metrical Translations from Thirty Languages and Dialects' (1835); 'The Zincali: or, an Account of the Gypsies in Spain' (1841); 'Lavengro, the Scholar, the Gypsy, the Priest' (1851), a sort of idealized autobiography; 'The Romany Rye,' a sequel to 'Lavengro' (1857); 'Wild Wales, Its People, Language and Scenery' (1862), and 'Romano Lavo-Lil' (1874), a dictionary of the gypsy language. Borrow was a strong, manly character, aggressively Protestant, delighting in horseflesh, boxing and the free, open-air existence of the gypsies whose life he knew so well, and despising heartily all affectation and false gentility. His later works, by their outspokenness, lost him much of the reputation earned by his 'Bible in Spain.' Consult the 'Life, Writings and Correspondence' by Dr. Knapp (2 vols., London 1899); T. Watts-Dunton's reminiscences in the *Athenæum* for September 1881, and studies by Redfern (Manchester 1913); Shorter (London 1914); Thomas (ib. 1912); and Walling (ib. 1908). See BIBLE IN SPAIN, THE; LAVENGRO.

BORROWING DAYS, the last three days of March, Old Style; the popular notion being, in Scotland and some parts of England, that they were borrowed by March from April. The fiction is of great antiquity and probably arose in the observation of a frequent wintry relapse about the end of March. Consult Buchan, 'Handy Book of Meteorology' (Edinburgh 1868).

BORROWSTOUNNESS. See BO'NESS.

BORSIPPA, a very ancient city of Babylonia, on the west bank of the Euphrates, which site is marked by the ruins Birs Nimrud. The chief deity was Nabu, the god of wisdom. His temple was E-Zida, to which pilgrimage was made at the New Year's festival.

BORSTELL, bor'stel, **Karl Heinrich Ludwig von,** Prussian military commander and humanitarian: b. Tangermünde 1773; d. 1844. As commander-in-chief in Pomerania in 1812, he largely prevented the excesses of the French; in 1813, on his own initiative, his bold move at Dennewitz gained the victory and he and his brigade were the first to enter Leipzig during the battle of 16–19 October. As lieutenant-general with Bülow's corps in Holland in 1814 he was left in command of the country with 10,000 men. In 1815 rebellion in his command of the 2d Prussian army corps broke out at Liège and Blücher ordered seven leaders to be shot and the flags to be burned of the revolted battalions. Borstell suspended the order and was sentenced to four years' military imprisonment. The King pardoned him a few months later and made him commander at Magdeburg.

BORT, a rounded, translucent variety of diamond, harder than the distinctly crystallized gem variety. It is of much value as an abrasive.

BORTNYANSKI, bort-nyän-skę, **Dmitri Stepanovitch,** Russian composer: b. Glukhov, Ukraine, 1751; d. Saint Petersburg, 2 Oct. 1825. He received his education at Moscow and at Venice and other Italian cities, under Galuppi. In 1779 he returned to Russia and was appointed director of the Imperial Chapel, devoting himself to the improvement and training of the choir. His compositions are almost entirely church music, which he reduced to a system, including 35 sacred concertos, a liturgy for three voices and a collection of psalms. His music, combining the spirit of both the Slavic and the Italian, is thoroughly original, devotional in feeling and made an epoch in Russian Church music.

BORY DE SAINT VINCENT, văṅ-sōṅ, **Jean Baptiste George Marie,** French naturalist: b. 1780; d. 1846. About 1800–02 he visited the Canaries, Mauritius and other African islands. He afterward served for a time in the army, being present at Ulm, Austerlitz and Waterloo, and conducted scientific expeditions to Greece and to Algiers. Among his chief works are 'Annales des sciences physiques' (8 vols., 1819–21); 'Voyage dans les quatre principales Îles des Mers d'Afrique' (3 vols., 1804); 'Expédition scientifique de Morée' (3 vols., 1832); 'L'Homme, Essai zoologique sur le genre humain' (2 vols., 1836).

BORYSTHENES, bō-rĭs'thĕn-ēs, the ancient name of the Dnieper.

BORZOI, or **RUSSIAN WOLFHOUND,** a hunting-dog of northern Europe, substantially the same as the ancient long-haired greyhound of the Arabs and Persians, whose coat has lengthened in adaptation to a cold climate. It is a lithe, active dog, standing 28–31 inches high at the shoulders and weighing from 75 to 105 pounds. Its hair is silky and loose, especially so on the tail, which, contrary to the other greyhound characteristics, is «feathered» longer than is the setter's, which it very much resembles. It has large padded feet. In color the borzois are combinations of black, white and tan. These dogs are popular, especially as stately attendants upon ladies, and good specimens may be seen at the principal kennel shows in the country.

BOS, Lambert, Dutch philologist: b. Workum, Friesland, 23 Nov. 1670; d. 6 Jan. 1717. He was instructed by his father in Greek and Latin. Vitringa, the distinguished Oriental scholar, was professor at Franeker, and thither young Bos went to pursue his philological studies. Not long after he was chosen Greek professor in that university. He is best known by his work entitled 'Ellipses Græcæ' (1702), though he was the author of several others, among which may be mentioned an edition of the Septuagint and 'Animadversiones ad Scriptores Græcos.'

BOSA, seaport on the west coast of Sardinia, province of Cagliari, built partly on the side of a hill crowned by an old castle and partly in an unhealthy plain. It has a cathedral and other churches, a theological seminary and is the residence of a bishop, suffragan to the archbishop of Sassari. It is in a wine and oil producing region and carries on coral fishing and tanning. It has fortnightly steamer communication with the mainland. Bosa was founded by Malaspina in 1112. Pop. 6,875.

BOSANQUET, bo'sän'kā', **Bernard**, English philosopher: b. Alnwick 1848. He was educated at Oxford; was lecturer at University College there, 1871–81, and from 1881 to 1897 was much engaged in university extension lecturing and charity organization. In 1903 he served as professor of moral philosophy at Saint Andrews University. He has written 'Logic, or Morphology of Knowledge'; 'History of Æsthetic'; 'Knowledge and Reality'; 'Essays and Addresses'; 'Civilization of Christendom' (1893); Essentials of Logic' (1895); 'Aspects of the Social Problem'; 'Psychology of Moral Self'; 'Companion to Plato's Republic, for English Readers'; 'Education of the Young in Plato's Republic'; 'Philosophical Theory of the State' (1912); 'The Value and Destiny of the Individual' (1913).

BOSANQUET, George Stanley, English naval officer: b. 1835; d. 1914. He was trained at the Royal Naval Academy of Gosport. He served in the Crimean War and was in China during the Tai-ping rebellion, where he was twice wounded. In recognition of his distinguished services he was made commander. He commanded the *Northumberland* in the Egyptian War of 1882 and was made aide-de-camp to Queen Victoria in 1884. The Chinese and Turkish governments gave him several medals.

BOSC, Louis Augustin Guillaume, French naturalist: b. Paris, 29 Jan. 1759; d. there, 10 July 1828. Employed in various public offices until 1793, his political sympathies made him obnoxious to the terrorists, and concealing himself in the forest of Montmorency, he resumed there, under the greatest difficulties, his favorite science botany, having already previously gained some distinction as a naturalist. On returning to Paris after the fall of Robespierre he was sent in 1796 as French consul to the United States; but, not recognized in this position by the American authorities, he explored the country for scientific purposes. In 1799 he was appointed chief of the administration of prisons, but lost the office on the 18th Brumaire. Applying himself thenceforward to literary labors, he made numerous contributions to natural science. His 'Histoire Naturelle des Coquilles' (5 vols., 2d ed., Paris 1824) and 'Histoire des Vers et des Crustacées' (2 vols., 2d ed., Paris 1829), and his studies on the vines of France are his principal achievements. He was made a member of the Academy of Sciences, of the Central Agricultural Society, and finally, after having been inspector of the gardens at Versailles, he became professor at the Jardin des Plantes at Paris. Roland, under whose administration he had served, and who perished with his wife on the guillotine, made him guardian of their daughter. Bosc published memoirs of the celebrated Madame Roland, and succeeded in obtaining for Mlle. Roland the confiscated property of her unfortunate parents.

BOSCAN ALMOGAVER, bōs-kän-äl-mō-gä-vâr, **Juan**, Spanish poet: b. Barcelona, about 1493; d. near Perpignan, April 1542. His parents, who belonged to the most ancient nobility, gave him a careful education. He followed the court of Charles V and in 1526 was attached to it for some time in Granada. His noble manners and character gained him the favor of the Emperor, and the education of the Duke of Alva was committed to him. After his marriage Boscan lived at Barcelona, occupied in publishing his works, together with those of his deceased friend Garcilaso, in which task he was employed at the time of his death. Boscan first naturalized Italian measures into Spanish, which were popularized by his successor De Vega and thus became the creator of the Spanish sonnet. His poems are still esteemed, the best edition being that published at Madrid in 1875. Among his works are 'Leandro y Hero' and 'La Allegoria.'

BOSCAWEN, Edward, British admiral: b. Cornwall, England, 19 Aug. 1711; d. near Guildford, Surrey, 10 Jan. 1761. He was the 3d son of the 1st Viscount Falmouth. Having entered the navy he distinguished himself at Porto Bello (1740) and Cartagena (1741), where he stormed a battery at the head of a part of his crew. In 1744 he was promoted to the *Dreadnought*, a 60-gun ship, in which he took the French frigate *Medea* and became known in the navy as «Old Dreadnought.» He commanded at the Nore during the Jacobite troubles in 1745. Three years afterward he signalized himself under Anson at the battle of Cape Finisterre. Toward the close of this year he was appointed commander-in-chief by sea and land in the East Indies, and was despatched thither with a squadron. He failed in attempts on Mauritius and Pondicherry, and in 1750 returned to England, where (1751) he obtained a seat at the Admiralty Board. In 1755 he became vice-admiral and sailed for North America, and in action with a French squadron two ships of the line fell into his hands. As one of the commissioners of the admiralty he signed the immediate order for the execution of Byng in 1757. In 1758 he was promoted to the rank of admiral of the blue, and in conjunction with Lord Amherst, who commanded the land forces, he was present at the capitulation of Louisburg. The year following, having then the command in the Mediterranean, he pursued the Toulon fleet, under De la Clue, through the Straits of Gibraltar, and coming up with it in Lagos Bay, completely defeated it, burning two ships and taking three. For these services he received the thanks of Parliament and $15,000 a year, with the rank of general of marines, in 1760.

BOSCH, bôs, **Hieronymus**, Dutch painter: b. S'Hertogenbosch, Brabant, about 1450; d. 1516. His name is often given as Hieronymus van Aeken, which probably means that his family came from Achen (Aix-la-Chapelle). The painter's residence, at least for many years, was S'Hertogenbosch (Bois-le-Duc), Brabant. We have in the register of a religious brotherhood of that city a few dated references to the artist, which, with some few records of pictures ordered from him by various patrons, is all that we possess as historically certain material about Bosch. The fact that numbers of his works went to Spain at an early period brought about the idea that the painter himself lived there. (At the Escurial we still find his ‘Paradise,’ the ‘Seven Capital Sins’ and three other works, and at the Prado, Madrid, ‘The Adoration of the Kings’ and ‘The Fall of the Rebel Angels’). No documentary confirmation of the theory exists however, and the birthplace, schooling and in fact the whole life history of Bosch remain a mystery. That he merits a high rating as a creative artist will be evident if we consider the art of the Low Countries at this time. In the neighboring cities of Belgium, painting had, to be sure, reached a marvelous technical development — which the Dutch were far from equaling. Bosch was one of the first men across the border to reach anything like the level of the Flemings, and at his best he approaches them quite nearly. It is perfectly safe to say that a born painter like Pieter Brueghel would never have studied Bosch as he did if the latter's beautiful art had not been used to embody his wild fancies. It is for these, however, that he is most remembered and there is not, in the range of European art, a more teeming imagination, a more astonishing inventiveness and fancy than that of the painter of the scenes of ‘Heaven and Hell,’ ‘the Last Judgment’ (Vienna Academy), the ‘Garden of Pleasures’ and the various ‘Temptations of Saint Anthony.’ In the former royal palace, Ayuda, Lisbon, is his well-known ‘Temptation of Saint Anthony,’ the most copied of all his pictures. The museum of Princeton University possesses his ‘Christ before Pilate.’ When he approaches religious subjects like the ‘Martyrdom of Saint Julia’ at Vienna, it is with a beautiful and naïve sincerity which makes them impressive. The landscape which he loves to introduce into his work shows the true Dutch affection for nature. As a technician, an imaginer and an expresser of national feeling Bosch adds to his own excellence the quality of the forerunner as is proved by many copies of his works made during his lifetime or soon after. The engravings after his works, formerly believed to be by Bosch himself, are now accredited to other hands. Paintings by Bosch are hung in galleries of Brussels, Berlin, Lisbon, Naples, Antwerp and New York. Consult Schubert, Soldern, ‘Hieronymus Bosch und Pieter Breugel’ (Vienna 1903); and ‘Von Jan van Eyck bis Hieronymus Bosch’ (Strassburg 1903); and Gossart, ‘Jérome Bosch’ (Lille 1907).

BOSCH, Hieronymus de, Dutch Latin poet and anthologist: b. Amsterdam, 23 March 1740; d. Leyden, 1 June 1811. His ‘Poemata’ (Leyden 1803; 2d ed., 1808) are ranked among the best Latin poems of modern times. His principal work is ‘Anthologia Græca’ (4 vols., Utrecht 1795–1810; 5th vol. by Van Lennep, 1822), which contains a hitherto unpublished metrical translation by Grotius. He also wrote critical and literary treatises of high value, was one of the founders of the Dutch Institute of Science and Art and curator of the Leyden University.

BOSCHBOK, the Dutch form of the English name «bush-buck,» given to several South African antelopes, specifically the *Tragelaphus sylvaticus.* It is prized for its venison.

BOSCHVARK, the bush-hog or bush-pig of South Africa (*Chœropotamus* or *Potamochœrus africanus*), one of the swine family, about five feet long, and with very large and strong tusks. The Kaffirs esteem its flesh as a luxury, and its tusks, arranged on a piece of string and tied round the neck, are considered great ornaments.

BOSCOBEL, England, a parish on the eastern verge of Shropshire, unimportant in itself, but remarkable historically as the hiding place of Charles II for some days after the battle of Worcester, 3 Sept. 1651. Boscobel House belonged at the time to a stanch royalist, and as it was judged a convenient place of retreat, Charles at once proceeded in that direction, and hid himself during the day in the thickest part of the wood. After making one attempt to escape through Wales, he was compelled to return again to his former hiding-place, and concealed himself among the branches of a pollard oak in Boscobel Wood, where it is related that he could actually see the men who were in pursuit of him and hear their voices. The «royal oak» which now stands at Boscobel is said to have grown from an acorn of this very tree. An account of Charles's adventures after the battle of Worcester was published in 1662, with the title, ‘Boscobel, or the Compleat History of his Sacred Majestie's most Miraculous Preservation after the Battle of Worcester.’ This history is attributed to Thomas Blount.

BOSCOVICH, Ruggiero Giuseppe, Italian Jesuit, mathematician, astronomer and philosopher: b. Ragusa, 18 May 1711; d. Milan, 12 Feb. 1787. After elementary education he entered the Society of Jesus in his 15th year and during a novitiate marked by brilliancy in mathematics and philosophy, before graduation, was appointed professor of mathematics in the Collegium Romanum in 1740. The remainder of his life was passed in scientific pursuits and important diplomatic missions. He visited London in 1760 and was elected a member of the Royal Society. In 1774 he went to Paris when the Jesuit order was suppressed; in 1783 he returned to Bassano to supervise the printing of his works and finally retired to Milan where insanity supervened on melancholia and he died four years later. He was the first Italian to advocate Newton's theories; in his ‘Philosophiæ Naturalis Theoria’ (Vienna 1758) he expounds a molecular theory of matter. He wrote numerous treatises on astronomy and other branches of physical science; his didactic poem, ‘De Solis ac Lunæ Defectibus’ (London 1764), was translated into French by the Abbé de Barruel (Paris 1779); his narrative of his journey from Constantinople to Poland appeared in French in 1772, in German in 1779 and in Italian in 1784; he published annotated editions with supplements of Noceti's works on the rainbow and the aurora borealis, and of Benedict Stay's poems on the Cartesian and other modern philosophical systems; and his complete works appeared as ‘Opera Pertinentia ad Opticam et Astronomiam’ (5 vols., Bassano 1785). Consult Oster, M., ‘Roger Joseph Boscovich als naturphilosoph’ (Bonn 1909).

BOSELLI, Paolo, Italian statesman, historian and economist: b. Savona, 18 June 1838.

At 22 he had graduated, taken his LL.D. degree at the University of Turin, and begun his literary career on the *Italia Letteraria,* then recently founded and edited by Angelo de Gubernatis. His style was of a nervous yet flexible and vigorous quality, with a terse and deliberate conception accompanied by an innate faculty for grasping intricate problems and presenting them concisely to the reader. After a few years of this experience he entered the civil service, and in 1867 acted as secretary-general for the Italian section at the Paris Universal Exhibition. Even before he was first elected to Parliament — in 1870 — by his native town he had been appointed a member of the Permanent Committee of Finance. He quickly gave evidence of a masterly comprehension of those subjects primarily within the scope of government, such as finance, agriculture, education, shipping, taxation, commercial treaties, etc. He published numerous works on these subjects, contributed important speeches in the Chamber of Deputies, and labored earnestly to improve the condition of the working classes. Born in a seaport town, he had early realized the immense value of shipping to an industrial community. It was mainly due to his efforts that a mercantile marine board was created, of which he was made president in 1881. During his tenure of this office he was specially active in negotiating commercial and navigation treaties with other countries. Premier Crispi sent him to Paris as a confidential agent to treat directly with M. Rouvier, the French Premier. The following extract from a letter written by Signor Boselli in Paris to his chief in Rome during the first week of September 1887 is not without interest 30 years after the event. He informs Crispi that Rouvier «declares that the understanding between France and Russia concerning the Egyptian question gave rise to the supposition that the relations between the two countries were more intimate than is really the case. for no written contract exists between them, whereas something in writing *does* exist between Germany and Italy. He is aware that our understanding with Germany concerns only a war of *defence* on the part of Germany, a war, he adds, which will never take place, for *France will not open hostilities against Germany.* (These words must, of course, be taken simply for what they are worth). The party, so-called, of *revanche,* and of war against Germany, represents, so Rouvier says, but a very small minority in France; and as for Italy, no Frenchmen, or at least very few, either wish for war with her or would seek to bring it about.»

From 1888 to 1891 Signor Boselli was Minister of Instruction — his first cabinet post. Two years later he became Minister of Agriculture, and subsequently Minister of Finance, which office he held until 1896, and for a second time from 1899 to 1900. Side by side with his political activities he pursued the studies of his early literary career and for a time he occupied the chair of financial science in the University of Rome. For some years prior to the European War Signor Boselli had taken no prominent part in the Chamber debates. In January 1916 King Victor Emmanuel conferred a signal mark of confidence and favor upon him by bestowing the Collar of the Annunziata, which carries with it the title of «Cousin of the King.» In June 1916 the Salandra Cabinet fell; by a direct vote of confidence the government were defeated by 197 to 158, the adverse majority being composed of Giolittians, Radicals, Official Socialists, Conservatives, Republicans and the so-called Interventionist Socialists. Premier Salandra resigned with his cabinet on 12 June, and Signor Boselli was called to the helm of the state within two days of his 78th birthday. He quickly formed a strong coalition cabinet and justified the confidence reposed in his moderating influence to hold together a heterogeneous ministry. His retention of Baron Sonnino at the Foreign Office was highly satisfactory to the Allies. After having been already at war with Austria for 15 months, Italy declared war on Germany two months after the accession of the Boselli Cabinet.

The great Austro-German drive against Italy in October 1917 had the effect of producing a ministerial crisis. A vote of confidence was defeated in the Italian Chamber of Deputies by 314 to 96 on 25 October. Signor Boselli resigned with his cabinet and was succeeded by Signor Orlando. See ITALY.

BOSH, a pure Turkish word meaning nonsense, useless, vain, empty, void of meaning, loose, unemployed, let go, divorced; also used in numerous combinations with other words. This word, generally regarded as slang, is now quite at home in the English language, and has even acquired still more interpretations. As an interjection it expresses foolish talk or opinions, humbug, worthless, contemptible nonsense, etc. It became popular in England in 1834, when it appeared in Morier's novel ‹Ayesha,› and may be found in the writings of Kingsley, Dickens and Miss Yonge. To «bosh» a job is to spoil it; in this sense the word is also used. In 18th century English, it meant to swagger, flaunt, to «cut a bosh.» The word *bosh* is used in smelting works to designate the lower part of a blast furnace shaft; also a kind of cooling trough.

BOSHER, Kate Langley, American novelist: b. Norfolk, Va., 1 Feb. 1865. Her novels distinguished by clever humor and sentiment achieved wide popularity and include ‹Mary Cary› (1910); ‹Miss Gibbie Gault› (1911); ‹The Man in Lonely Land› (1912); and ‹The House of Happiness› (1913).

BOSIO, bôz′yō, **François Joseph** (BARON), French court sculptor: b. Monaco, 19 March 1769; d. Paris, 29 July 1845. He was brother of the historical and portrait painter Jean François Bosio; at first a pupil of Pajou in Paris; later a devoted student of the antique. His masterpiece is the bronze equestrian statue of Louis XIV in the Place des Victoires. After the completion of this he was appointed, 6 Nov. 1822, chief sculptor to the king. Well-known busts by him are those of Napoleon, at Versailles, of Josephine, Hortense and Charles X.

BOSNA-SARAI, or **SARAJEVO** (ancient TIBERIOPOLIS), capital of Bosnia, situated on the Miljacka, which is here crossed by a handsome stone bridge, 122 miles southwest of Belgrade, and 570 miles west-northwest of Constantinople. The town was founded about

1263. It is well built, and although most of the houses are of wood, has a gay and pleasant appearance from the number of towers and minarets with which it is embellished. It contains a *serai* or palace, built by Mohammed II, to which the city owes its name; many mosques, great and small; churches, monasteries, two large bazaars, schools, baths and charitable institutions. It was formerly surrounded with walls, but these are now completely decayed; and its only remaining defense is a citadel, built on a rocky height at a short distance east from the town, mounted with cannon. Sarajevo is the chief mart in the province, the centre of commercial relations between Turkey, Austria and South Germany; and has, in consequence, a considerable trade. It is connected by rail with the chief points of the peninsula. It has manufactures of arms and utensils of copper; ironware, woolen and worsted stuffs, morocco leather, cottons, etc. There are also several tanneries in the city, and at a short distance from it several important iron mines; and on a plain which stretches to the west the baths of Sarajevesko Polje. Here on 28 June 1914, the Archduke Franz Ferdinand, heir presumptive to the Austrian empire, was assassinated. This foul deed was the proximate cause of the European War. Pop. 51,919.

BOSNIA (Serbian Bosna) and **HERZEGOVINA**, the extreme northwestern provinces, or pokraine of the Balkan Peninsula, bounded north by Croatia and the river Sava, west by Dalmatia and the Adriatic, east by Serbia, from which they are separated by the river Drina, and south by Montenegro, are now constituent parts of the Serb-Croat-Slovene State. The area of the provinces is 51,199 square kilometers. The principal rivers are the Vrbas, the Una and the Drina, all tributaries of the Sava. Through Herzegovina flows the river Neretva. With the exception of the Sava and the lower course of the Drina, none of these rivers is navigable. The northern part of Bosnia is level and very fertile but the south, and especially Herzegovina, is very mountainous and picturesque. The provinces are divided into six departments, which are subdivided into 50 «kotars» (districts.) The capital of Bosnia is Sarajevo (51,919 inhabitants) where is the seat of the local government and where, on 28 June 1914, Archduke Franz Ferdinand and his consort were assassinated by two fanatic Austrian malcontents, which precipitated the great European War. Other important towns are Mostar (20,000 inhabitants), Banjaluka, (numbering about 1,900,000), are almost exclusively Serbians, but there are also Turks, Greeks, Jews, Gypsies, etc. They are partly Orthodox (856,158), partly Roman Catholic (451,686), and Mohammedan (626,649). The language of the population is most predominantly Serbo-Croatian, but other languages (German, Turkish, etc.) are also spoken. The Bosnian Serb is the best conserved type of the entire Serbian race. The women, like the men, are well and strongly made and mostly good-looking with their dark eyes and complexion.

Industry.— Agriculture, mining and forestry are the principal occupations of the population. The annual harvest amounts to about 1,000,000 quintals of wheat, 9,000,000 quintals of hay and great quantities of potatoes, prunes and raisins. The annual value of the mineral exports amounts to about $3,000,000 and that of the timber export to about $6,000,000. The breed of cattle is excellent and the mountains furnish good iron of which a great part is manufactured in the country into guns and blades. The other articles manufactured are leather, morocco and coarse woolen cloth. The wines of Herzegovina are renowned for their excellence and the salt beds at Tuzla constitute one of the chief resources of national wealth. There is a sugar refinery at Doboj and at Sarajevo there are several mills producing beautiful and well-made carpets and rugs.

History.— Bosnia and Herzegovina have been constituent parts of the Roman empire known as Illyricum. In the course of the 10th century, Bosnia formed a distinct bandom, or principality, suzerain to the Croatian crown, but the first Ban who succeeded in securing a form of independence for his province was Boris, the illegitimate son of Koloman, King of Hungary. Yet the true history of Bosnia begins only with the rule of her Ban Kulin (1180–1204), the contemporary of the Serbian Grand Župan Nemanja, who extended the boundaries of his territory to a considerable degree and accepted and spread throughout his realm the Bogumil heresy. His son Stefan continued the spread of Bogumilism, an act which not only alienated the friendship of the Serbian rulers who prosecuted that heresy, but which gave rise to a vehement influence from Rome and Hungary.

The pope Honorius VI (and later Gregory VII) made several alliances with the Hungarian princes and started crusades against the Bogumils. The country was devastated and the majority of the heretics exterminated; those who survived took refuge in the mountains inaccessible to the Magyar horsemen. Ban Pavle Šubić (*banus Croatorum et Bosniæ dominus*) annexed Herzegovina to Bosnia but both provinces were conquered and incorporated in the Serbian empire by Emperor Dušan the Mighty. It was only after the death of this Serbian Emperor (1355) that Ban Stefan Tvrtko (1353–91) detached definitely Bosnia from the Serbian empire and proclaimed himself king. Ban Tvrtko also conquered Dalmatia with exception of Dubrovnik (Ragusa) and his kingdom reached its summit in development as an independent state. However, this did not save Bosnia from her final downfall, for Sultan Mohammed II, after having utterly defeated the Magyars, turned with his 150,000 men against Bosnia (1463) and devastated the land. Bosnia's Ban Stefan VII Tomić was taken prisoner and both Bosnia and Herzegovina became Turkish vilayets. Throughout the 17th and 18th centuries there were continuous wars between Austria and Turkey for Bosnia and Herzegovina, until 1831 a national insurrection took place under the leadership of Hussein-Bey in the course of which Rashid-Pasha was chased out of the land and the insurgents threatened the Sublime Porte with a definite separation from the Ottoman empire. This, however, was frustrated by Kara-Mahmud-Pasha who, with his army of 60,000, drove Hussein-Bey to Austria and severely punished the restless population; 30,000 boys of seven years of age were taken away to Constantinople to the celebrated military training schools which furnish the irresistible hordes

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of Janissaries to the Sultans of Turkey. A state of anarchy ensued and Bays became almost independent of Constantinople; there were some who openly advocated the extermination of the Christians. Such a state of affairs alarmed the Sublime Porte which immediately sent one of its best generals, Omer-Pasha, at the head of a huge army to restore order and the sovereignty of the Sultans. A wholesale Ottomanisation of the Serbian population made the existence of the Christians almost impossible and the numerous deputations to Constantinople imploring protection remained without avail. The landlords embraced the Koran and became absolute feudal lords of the enslaved population. This unbearable state of things led directly to a revolution (in 1875) in Herzegovina which speedily spread over all Bosnia under the leadership of the ever-watchful Catholic priests who obtained support from Rome and, more especially, from covetous and Catholic Austria. The Turks immediately started a campaign against the insurgents but a fresh insurrection was kindled in Montenegro which involved Turkey in a fierce war with that principality and with Serbia. As the movement of the Christians spread even in the Tartar Bulgaria, the Russian Tsar intervened and, in 1877, declared war on Turkey which ended successfully for the Christians by the Treaty of Peace at Saint Stefano (1878). By virtue of that treaty Bosnia and Herzegovina obtained autonomy and a Christian governor; but the Treaty of Berlin changed completely the position of those provinces, for Austria was allowed to occupy the territories with her troops for the purpose of introducing order among the insurgents and establishing an equitable administration of the country. The occupation was, however, bitterly opposed by the Bosnian Serbs under the leadership of their native general Hadzi-Loja. Herzegovina, deriving its name from *Herzog*, or Duke ("Duke of St. Sava," i.e., Stefan Vukčič, who ruled the province independently in 1448) was occupied without any serious opposition on the part of the population. As early as 1879 the Austrian Reichsrat wished to effect a definite annexation of Bosnia and Herzegovina, but the Sublime Porte energetically and successfully defended its sovereign rights over the provinces on the basis of the fact that such an action does not belong to the competence of the Austro-Hungarian government but to all the powers signatory of the Treaty of Berlin. Yet in wanton violation of that treaty and upon the advice of her ally, Germany, Austrian sovereignty was formally announced on 5 Oct. 1908, which act nearly led to an armed conflict between the dual monarchy and Serbia. Russia, which was utterly unprepared to intervene, counselled Serbia to patience and moderation and war was avoided, or rather postponed. The political life previous to the annexation consisted chiefly in the struggle for autonomy of the Orthodox and Moslem Serbs against the proselytizing Austrian régime. In order to give some satisfaction to the seditious population, whose national dream it was for centuries either to obtain an autonomy or to effect a political union with the Serbian kingdoms of Serbia and Montenegro into one homogenous state, Austria granted a sort of charter which could hardly be called constitution, for the electoral system, provided by that instrument, was based on a division of the electors according to their religious belief, and the ballot was public so that it was absolutely subjected to the influence and control of the Vienna government. The Home Diet (*Sabor*) had a purely local authority and was not permitted to deal with the matters bearing upon imperial affairs, such as the establishment of the military contingent, customs regulations, foreign affairs and commerce, amendments of the constitution, etc., nor could the bills be discussed in the Sabor to which the imperial government was in no wise responsible. The president of the Sabor, who was appointed by the Emperor upon the recommendation of the government, exercised practically absolute power over the sessions. As an intermediary between the central government and the Sabor there was a Country Council (Zemaljsko Vieće), the deputies for which were chosen from amongst the members of the Sabor. This council acted as an advisory board to the Vienna government. In the Council of the Empire and the Imperial Parliament Bosnia and Herzegovina were represented by the Austrian Imperial Minister of Finance, who was, at the same time, Minister of Home Affairs for Bosnia, and it was in this latter capacity alone that he was responsible to the sovereign. After the fall of the Austro-Hungarian empire in 1918 as a result of the World War, Bosnia and Herzegovina joined Serbia, Montenegro, Croatia, Dalmatia and Slovenia to form the new republic of Jugoslavia.

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Chief of Slavonic Division, New York Public Library.

BOSPORUS, or **BOSPHORUS** (that is, «Oxford»), the strait, joining the Black Sea with the Sea of Marmora, and separating the continents of Europe and Asia, called also the Strait of Constantinople. It is 18 miles long, and varies in width from about 2,000 feet in the middle to about 2¾ miles at the northern entrance. The depth is from 20 to 66 fathoms. The swiftness of the currents, and occasional fogs, make navigation dangerous. The strait is defended by a series of strong forts, and by agreement of the European powers in 1841, confirmed by the Treaty of Berlin in 1878, no ship of war belonging to any nation shall pass the strait without the permission of Turkey. At the northern end lies the Golden Horn, one of the finest natural harbors in the world, on either side of which Constantinople is built. Over the middle of the channel Darius constructed a bridge of boats, on his expedition against the Scythians.

During the European War and the unsuccessful Dardanelles campaign (1915–16), the gauntlet of the Bosporus was run by British submarines which attacked Constantinople. See Gallipoli.

The Cimmerian Bosporus was the name given by the ancients to the strait that leads from the Black Sea into the Sea of Azov, now the Strait of Kerch or Yenikale, the other Bosporus being distinguished as the Thracian Bosporus. There was anciently a Greek kingdom of the name of Bosporus, so called from the Cimmerian Bosporus, on both sides of which it was situated. The capital of this kingdom was Panticapæum (represented by the modern Kertch), in the Tauric Chersonese, the ancient name of the Crimea. This kingdom was founded about 480 B.C. Spartacus was among the first kings. Under a successor, Satyrus, the kingdom was extended to the coast of Asia, and his son Leucon farther extended it by the conquest of Theodosia. He improved the commerce of the country (in particular by the exportation of corn to Athens, also of fish, fur, skins, bees-wax and slaves). From him his descendants were called Leuconidæ. Leucanor became tributary to the Scythians 290 B.C., and the tribute was finally so oppressive that Parisades, the last of the Leuconidæ, preferred to submit to Mithridates, King of Pontus, who vanquished the Scythians under Scilurus 116 B.C., and made his son King of Bosporus. At the death of Mithridates the Romans gave the country, 64 B.C., to his second son, Pharnaces, who was afterward murdered. The Romans placed different princes successively upon the throne, who all pretended to be descendants of Mithridates. When this family became extinct, 259 A.D., the Sarmatians took possession of the kingdom, from whom it was taken by the Chersonesians in 344. The Tauric Chersonese then belonged to the Eastern Empire, till it was seized by the Chazars, and afterward by the Tartars, under the Mongol princes. Consult Goryainov, 'Le Bosphore et les Dardanelles: étude historique sur la question des détroits' (1910); Minns, E. H., 'Scythians and Greeks' (Cambridge 1907); Sallet, A. von, 'Beiträge zur Geschichte und Numismatik des Cimmerischen Bosporus' (Berlin 1866).

BOSQUET, bos-kā, **Pierre François,** French soldier: b. Mont de Marsen, France, 8 Nov. 1810; d. Toulouse, 5 Feb. 1861. In 1829 he entered the Polytechnic School and in 1833 became a sub-lieutenant in the artillery. In 1835 he went with his regiment to Algeria, where he served in 20 campaigns, especially distinguishing himself in the campaign of Kabulia. By 1848 he had risen to be a brigadier-general. In 1854 the Emperor Napoleon III raised him to the rank of general of division, and enrolled him in the staff of the army of Marshal St. Arnaud. He was with the French army in the Crimea, distinguished himself at Alma and Inkerman, and took a leading part in the capture of the Malakoff tower at the siege of Sebastopol, where he was badly wounded. In 1856 he was made a marshal of France and a senator.

BOSS, Lewis, American astronomer: b. Providence, R. I., 26 Oct. 1846; d. 5 Oct. 1912. He was graduated at Dartmouth College, in 1870; astonomer of the Northern Boundary Survey for the determination of the line between the western part of the United States and British America; and, since the completion of that work, director of the Dudley Observatory, Albany, N. Y. He was chief of the United States party sent to Chile in 1882 to observe the transit of Venus; was State superintendent of weights and measures of New York from 1883 to 1906; was elected a member of the National Academy of Science in 1889 and an honorary foreign associate of the Royal Astronomical Society in 1890. After 1909 he edited the *Astronomical Journal* and in 1911 the Paris Academy of Sciences awarded him the Lalande prize. He is best known for his work upon star declinations, undertaken in connection with his work on the boundary survey, which is the most complete investigation of the kind ever executed, and for his 'Catalogue of 8,241 Stars' — which was a part of the 'Co-operative Catalogue' prepared by leading astronomers of Europe. His other works are '179 Southern Stars' (1898); 'Solar Motion and Related Researches' (1901); 'Positions and Motions of 627 Standard Stars' (1903); 'Preliminary General Catalogue of 6,188 Stars' (1910); 'Catalogue of 1,059 Standard Stars' (1910).

BOSS, Dutch baas, master or superintendent, a master or overseer, a term often applied to the superintendent of a gang of workmen. In American politics, the term came into use after the exposure of the Tweed Ring, to designate the leader of a political organization who retains his power by unscrupulous methods and the use of public offices as rewards for his supporters.

In Gothic architecture the protuberance in a vaulted ceiling formed by the junction of the ends of several ribs, and serving to bind them together; usually elaborately carved and ornamented. The meaning has been extended to mean any knob-like projecting carved ornament resembling a vault-rib keystone.

In geology, see Batholith.

BOSSCHA, bos'sạ, **Johannes,** Dutch scientist: b. Breda 1831; d. Delft 1911. After studies in Deventer and Leyden, he received the appointment of director of the Delft Polytechnic School in 1878. He was the first physicist who demonstrated (in 1885) the feasibility of sending two telegraphic messages simultaneously over the same wire, and the results of his investigations on the rapidity of sound waves, the mechanical theory of electrolysis and galvanic polarization were of great importance. His writings were published as ‹Verspreide Geschriften› (3 vols., Leyden 1902).

BOSSE, bŏs'sĕ, **Abraham,** French engraver and etcher: b. Tours 1605(?); d. there 1678. He lived most of his life in Paris, studied under Jean St. Igny and Claude Mellan, and was professor in the Royal Academy of Painting there. He prepared about 800 plates representing festivals and various scenes in the life of the people. He wrote also ‹Traité des manières de graver en taille douce sur l'airain par l'eau forte et les vernis durs et mols.› A catalogue of his works was published by Duplessis, Georges (Brussels 1859). Consult his biography by Valabreque (Paris 1892).

BOSSE, Robert, German statesman: b. Quedlinburg 1832; d. 1901. He studied law at Heidelberg, Halle and Berlin, held different offices in Prussia and in 1876 he entered the Prussian ministry. In October 1889 he became Under-Secretary of State in the imperial Department of the Interior and in this capacity had an important part in framing the laws for the insurance of workingmen and in defending them in the Reichstag. In 1891 he became secretary in the Department of Justice and was president of the commission to frame the new Civil Code. In 1892 he again entered the Prussian ministry as Minister of Education. He was editor of the ‹Monatsschrifte für deutsche Beamte›; and he wrote ‹Kommentar zum Invaliditäts — und Alterversicherungsgesetz› (3d ed., 1891); ‹Eine Dienstreise nach dem Orient› (1900); and several articles in sociological and legal periodicals.

BOSSI, bŏs-sē, **Enrico Marco,** Italian composer: b. Salò 1861. He was educated at the Milan Conservatory, was organist in the Como cathedral and instructor in organ-playing at the Naples Conservatory. He served as director of the Venice Conservatory, 1895–1902 and in 1902–13 as director of the Bologna Music Lyceum. He is considered one of the foremost of Italy's living composers. His musical compositions include an organ concerto, ‹Il Cieco,› an opera, and ‹Canticum Canticorum,› a sacred cantata, a requiem and some chamber music. He has written (with Tebaldini) ‹Method of Study for the Modern Organ.›

BOSSI, Giuseppe Carlo Aurelio, Italian politician and poet: b. Turin, 15 Nov. 1758; d. Paris, 20 Jan. 1823. When only 18 years old he made a successful début as a dramatist. In 1792 he was sent on a diplomatic mission to Berlin and a few months later to Saint Petersburg. In 1796 King Charles Emanuel IV appointed him his agent near General Bonaparte. He acted a somewhat conspicuous part in the various changes imposed upon the Sardinian states by the directory and the consular government of France; and finally was, with Carlo Giulio and Carlo Botta, a member of the triumvirate which governed Piedmont previous to its annexation in 1802. Some two years later he entered the French civil service and was appointed prefect of Ain. In 1810 he was made a baron of the empire and promoted to the prefecture of Manche, which post he kept on the first restoration; but having, in March 1815, adhered to Napoleon, he was dismissed on the second return of the Bourbons. He wrote some lyrical poems and also ‹L'Indipendenza Americana,› ‹La Olanda pacificata,› in two cantos, and ‹Oromasia,› in 12 cantos, giving a description of the principal events in the French Revolution.

BOSSI, Luigi (Count), Italian historian and archæologist: b. Milan, 28 Feb. 1758; d. there, 10 April 1835. After studies in jurisprudence and natural sciences at the University of Para he became a canon of Milan Cathedral. When Napoleon invaded Italy he was appointed agent of the French government in Turin and after Sardinia was annexed in 1803, keeper of the archives of the kingdom of Italy. His writings comprise over 80 works on archæological, scientific and historical subjects, including ‹Observations sur le vase que l'on conservait à Gênes sous le nom de Sacro Catino› (1807); ‹Storia della Spagna› (8 vols., 1821); ‹Istoria d'Italia› (20 vols., 1819–23); ‹Introduzione allo studio delle arti del disegno›; an elaborated edition in Italian of Roscoe's ‹Life of Leo X› (12 vols., Milan 1816–17), a volume of dramas, besides contributions to periodicals and academic annuals.

BOSSUET, bôs-swā', **Jacques Bénigne,** bishop of Meaux: b. Dijon, 27 Sept. 1627; d. 16 April 1704. While attending the Jesuit College at Dijon he got possession of a Latin Bible, which made an indelible impression upon him. At the age of 15 he was sent to Paris, where he entered the College of Navarre, the president of which, Nicholas Cornet, took pleasure in forming his mind. Bossuet, under the direction of this worthy teacher, studied Greek and the Holy Scriptures, read the ancient classics and investigated the Cartesian philosophy. He was made doctor of the Sorbonne and canon in Metz in 1652. Here he edified his hearers by his preaching and example; was commissioned by his bishop to refute the catechism of the Protestant minister Paul Ferry and did it in such a way that even his antagonists were obliged to respect him (1655). The Queen-mother (Anne of Austria) was induced, by this work, to employ Bossuet in the conversion of the Protestants in the diocese of Metz. Meantime his fame as a preacher was rising. The sermon which he delivered in 1668, on the occasion of Marshal Turenne's joining the Roman Church, was followed by his appointment to the bishopric of Condom (1669). In 1670 the King charged him with the education of the Dauphin. In consequence of this appointment he resigned his bishopric in 1671, because he thought it inconsistent with his duty to retain it during a continual absence from this diocese. At this time he delivered his sermon at the funeral of the Duchess of Orleans, which established his fame in this class of oratory, in which he stands supreme. His last sermon of this kind (at the tomb of the great Condé) is considered as a masterpiece. The manly vigor which characterized his orations is seen also in the ‹Discours sur l'Histoire Universelle,› designed for the instruction of his royal pupil. The care which he took of the education of this prince — an obstinate, stupid youth, who had no intellect to develop — was rewarded in 1680 by the office of the first almoner of the Dauphin. In 1681 he was made bishop of Meaux; in 1697 he obtained the dignity of a councillor of state and a year afterward that of the first almoner of the Duchess of Burgundy. His practice and his doctrine were equally severe. All his time was divided between his studies and the execution of his official duties; he seldom allowed himself any recreation. The learned Benedictines of the Brotherhood of Saint Maur published a complete edition of the works of Bossuet in 43 volumes 8vo (Versailles 1815–19); the best edition is that edited by Lachat (31 vols., 1862–66).

Bossuet was unrivaled as a pulpit orator, and greatly distinguished for his strength and acumen as a controversialist. He was the leader of the Gallican church in the dispute between King and Pope, and to his eloquence was due the adoption of the compromise of 1682. He was a strong supporter of the conservative tradition; the object of his philosophical writings was to provide authority with a rational basis. Among the most celebrated of his works are his ‹Oraisons Funèbres›; ‹Histoire des Variations des Eglises Protestantes,› in which he contrasts the unity of the Catholic Church with the inconsistencies and variations of Protestantism; ‹Politique tirée des propres Paroles de l'Ecriture Sainte.› He has described his own life at length. For his dispute with the archbishop of Cambrai, Fénélon, see FÉNÉLON and QUIETISM. Consult Lear, ‹Bossuet and his Contemporaries› (London 1874); Currier, ‹Nine Great Preachers› (Boston 1912); Sir J. Stephen in ‹Horæ Sabbaticæ› (London 1892).

BOSSUT, bôs'sü', **Charles**, French mathematician: b. Tartaras, in the department of the Rhône, 11 Aug. 1730; d. 14 Jan. 1814. He was educated at the Jesuit College, Lyons, and having met with the ‹Eloges of Fontenelle,› was smitten with so eager a desire to imitate the distinguished individuals therein described, that he wrote to Fontenelle himself on the subject. That veteran, now 90 years of age, not only answered the letter, but expressed such an interest in the future progress of his young correspondent, that Bossut repaired to Paris and was introduced by Fontenelle to Clairaut and D'Alembert, the latter of whom he appears to have particularly admired and studied to imitate. In 1752 he was appointed professor of mathematics to the school of Mézières and held that office for 16 years, during which he gained several prizes offered by the Academy of Sciences. He was afterward (1768) admitted a member of that body and was at the same time appointed examiner of candidates for the artillery and engineers. At the Revolution he was deprived of all his appointments and afterward lived in retirement till his death. His most important works are a ‹Course of Mathematics,› which was long in repute as a textbook; a ‹Treatise on Hydrodynamics›; the ‹Introductory Discourse to Mathemathics,› and various other articles in the Encyclopédie; and a ‹History of Mathematics.› He also edited the works of Pascal.

BOST, Paul Ami Isaac David, Swiss ecclesiastical writer: b. Geneva, 10 June 1790; d. La Forge, France, 14 Dec. 1874. He studied theology at the University of Geneva, graduating in 1814. After four years spent as a minister in Switzerland, he began his «Missionary Journeys» under the auspices of the London Continental Society, a work he was destined to continue for 35 years. Withdrawing from the Geneva society, he was expelled from France and entered upon a roving, poverty-stricken life, the difficulties of which were increased by the burden of a large family. Expelled from France on account of his views, he preached in Offenbach, Frankfort, Hanau, Friedrichsdorf, Karlsruhe and other places. He was pastor of the free church of Bourg-le-Tour in Geneva (1825–26), where he published ‹Defense de ceux des fidèles de Genève qui se sont constitués en églises independantes› (1825). He was tried for slander and fined 500 francs. He resigned his pastorate and founded a new congregation at Carouge which he discontinued after two years to establish *L'Esperance,* a religio-political magazine (1838). Two years later he was admitted to the ranks of the clergy of Geneva without retracting any of his views and he became successively pastor at Asnières and Bourges (France) and chaplain of the prison of the Maison Centrale at Melun. This he resigned in 1848, after which he was in Geneva, Nimes, Neuchâtel, Jersey and Paris, coming finally to La Force. In addition to his reputation as a hymn writer, Bost has to his credit works of considerable interest in connection with the religious movement of which he forms an integral part. These include ‹Genève religieuse› (Geneva 1819); ‹Histoire des Frères moraves› (2 vols., 1831, London 1834); ‹Sur la primauté de Pierre et son Episcopat› (1832); ‹Histoire général de l'établissement du Christianism› (4 vols., 1838; a translation and revision of Blumhardt's great work); ‹Les prophètes protestants› (Melun 1847); and ‹Mémoires pouvant servir a l'histoire de réveil religieux› (Paris 1854–55).

BOSTANJI, a class of men in Turkey, numbering about 600, originally the Sultan's gardeners, but now also employed in several ways about his person, as mounting guard at the seraglio, rowing his barge, etc., and likewise in attending the officers of the royal household. Their chief is called Bostanji Bastri, holds the rank of pasha and is chief of the police of the capital and governor of the Sultan's residences. They perform military duty.

BOSTON, England, a municipal and parliamentary borough and port of Lincolnshire, situated on the river Witham, about five miles from the sea, 30 southeast from Lincoln. It derived its name (a corruption of Botolph's town) from Saint Botolph, who founded a monastery here about the year 650. Its chief interest for Americans lies in the fact that it was the English home of the most influential of the settlers of Boston, Mass. The port had formerly a flourishing trade, but owing to various causes, and especially the fact that in dry seasons the river became choked up with sand brought in by the tides, this trade greatly declined. In 1881 a new channel was constructed so as to bring the town within three miles of the sea by navigable water; and a new dock of seven acres area, capable of admitting vessels of 3,500 tons at the highest tides, was opened three years later. Boston contains some fine buildings, notably the parish church of Saint Botolph, the Cotton chapel and various other places of worship, a grammar school dating from 1554, the Athenæum, the Guildhall and the Assembly rooms, under which are arranged the butter-market, poultry-market and the police-station. Saint Botolph's Church is a very large and handsome Gothic structure, with a tower, known as Boston Stump, 282 feet high, containing a carillon of 36 bells cast at Louvain. In the upper part of the tower, octagonal in shape, lights used to be suspended for the guidance of mariners at sea and travelers crossing the fens by night. The town is now well supplied with water brought from a reservoir distant about 14 miles. The leading industries comprise iron and brass foundries, the manufacture of farm implements, sails, ropes and bricks, and tanning, brewing and malting. Fishing also gives occupation to many of the inhabitants, and there is steam communication with Hull and London. Pop. (1911) 16,673. The borough returns one member to Parliament.

BOSTON, Mass., the capital of the State, and, according to the United States census of 1920, seventh city in population in the United States. It is situated on the western shore of Massachusetts Bay.

History.— The settlement from which it has grown was made in 1630 by members of the Massachusetts Bay Company, bearing with them the charter granted to this organization by Charles I. The leader of the first expedition of settlers who landed at Charlestown, 17 June 1630, was Gov. John Winthrop, a Puritan gentleman. In his fleet came others of like condition, Sir Richard Saltonstall, Isaac Johnson and his wife, the Lady Arbella, daughter of the Earl of Lincoln, together with a company of sturdy Puritans, chiefly from Lincolnshire. They landed 700 or 800 strong, a number soon increased to 1,000 and then to 2,000 by later arrivals — the most considerable settlement on the American coast. At the end of the first summer, a season of hardship, they moved across the Charles River to the promontory of Shawmut — an Indian word translated «living fountains.» This headland, with ample water-supply, was called by the English settlers Trimountain, from the three-peaked hill, now Beacon Hill, which formed its highest eminence. On 17 Sept. 1630 it was voted to change its name to Boston, after the Lincolnshire town from which some of the chief settlers had come. The original settler of the land, the Rev. William Blackstone (q.v.), a scholar who had left England to avoid the «lord-bishops,» sold the newcomers his land and moved on to Rhode Island, in order to escape the «lord-brethren.»

From the first the power of the Puritan clergy was important. Church and State were practically one. Trained in the English universities, the ministers set a true value upon education. A free public school was established in 1633, and in 1636 the General Court provided for the beginnings of Harvard College. The government of both town and colony was purely democratic, having for its unit the town-meeting, which in Boston itself maintained its sway, with the single interruption of British military rule at the outbreak of the Revolution, until the town became a city in 1822. Besides the training in self-government thus acquired, Boston had the advantage of virtual independence through its early years. At first the Crown was fully occupied with its own problems in England; and when Cromwell came into power, so strongly Puritan a settlement was naturally left much to its own devices. Thus the charter of the Bay Company and the liberties enjoyed under it became very dear to the people of Boston. When Charles II came to the throne there were grave fears that these liberties would be seriously curtailed. In 1664 four royal commissioners came from England to adjust difficulties in several colonies. Their mission to Boston was a failure, and for some years to come the town was secure under its original system of government.

Under James II came the dreaded change. Complaints of the Boston spirit of independence and religious intolerance were borne more frequently to the English court, and before the death of Charles II the Court of Chancery voted the Massachusetts Bay charter vacated. In the summer of 1686 the original government of the colony came to an end. Before the close of this year, Sir Edmund Andros, the new governor appointed by the king, the first chief magistrate in Massachusetts not chosen by popular election, arrived in Boston. Probably nobody in his peculiar place could have satisfied the people at this time. Within less than three years from his arrival a bloodless revolution in Boston, a well-organized uprising of the people, removed him from office. Early in 1690 he was sent back to England, where Increase Mather, the leading minister of Boston, had already been for nearly two years, trying to have the old charter restored, or to get the best possible substitute for it. This he succeeded in doing, after the accession of William and Mary, and had the further satisfaction of choosing the first governor under the new instrument making Massachusetts a royal province. With this governor, Sir William Phipps, Mather returned to Boston in the spring of 1692.

By this time Boston had grown to importance as the leading seaport, and in many respects the foremost town of America. Before the end of the 17th century its population was approximately 7,000. In another half century this number was more than doubled. A good idea of certain aspects of the town in this period is given by an Englishman, Daniel Neal, who wrote in 1719:

> "The bay of Boston is spacious enough to contain in a manner the navy of England. The masts of ships here, and at proper seasons of the year, make a kind of wood of trees like that we see upon the river of Thames about Wapping and Limehouse, which may easily be imagined when we consider that by computation given into the collectors of his Majesty's customs to the governor upon the building of the lighthouse, it appeared that there was 24,000 ton of shipping cleared annually.
>
> "At the bottom of the bay is a noble pier 1,800 or 2,000 foot long, with a row of warehouses on the north side for the use of merchants. The pier runs so far into the bay that ships of the greatest burthen may unlade without the help of boats or lighters. From the head of the pier you go up the chief street of the town [now State Street], at the upper end of which is the town house or Exchange, a fine piece of building, containing, besides the walk for the merchants, the Council-Chamber, the House of Commons, and another spacious room for the sessions of the courts of justice. The Exchange is surrounded by booksellers' shops which have a good trade. There are five printing presses in Boston, which are generally full of work, by which it appears that humanity and the knowledge of letters flourish more here than in all the other English Plantations put together; for in the city of New York there is but one bookseller's shop, and in the Plantations of Virginia, Maryland, Carolina, Barbadoes, and the Islands, none at all."

As in the 17th so in the 18th century, the clergy and ecclesiastical affairs loomed large upon the local horizon. The prominence in Boston records of what is known as the "Mather dynasty" — of which Increase and his son, Cotton Mather, were the chief figures — bears witness to this condition. The younger of these Puritan priests is remembered largely for his connection with the witchcraft delusion, which had its worst effects in Salem, but in temporal matters and humanitarian work he impressed himself no less forcibly on the life of his time. Of the devout laity, educated at Harvard College, giving themselves to public service, living private lives of dignity and piety, Samuel Sewall, whose diary preserves the true flavor of ancient Boston, stands as an admirable type. In contrast with the background of lives like his, the society of which royal governors were the central figures presents a less austere picture. About the governors, established from 1716 onward in a sort of vice-regal state in the Province House, gathered the more worldly element of the place — prosperous merchants, officials of the Crown, members of the King's Chapel congregation and the two other Anglican churches established before the middle of the century. Under the province charter religious liberty was increasing, and churches of various denominations — including even the Quakers, whose first representatives in Boston were hanged on the Common — had come into being. Meanwhile the constant friction between the governors and the General Court, always meeting in Boston, kept the spirit of political independence wide awake. A fruitful source of trouble was the annual grant voted by the court to the governor. A salary the people steadily refused to pay to an official not of their own choice; and the amount of the grant varied according to the personal popularity of the chief magistrate. Through all these years, moreover, the town-meeting was educating the people in self-rule, so that when the time was ripe for active opposition from American colonists to the colonial government of England, the men of Boston were ready to take a leading part in the struggle.

In 1761 James Otis, advocate-general of the province, resigned his position under the Crown in order to contest the Writs of Assistance, which permitted customs officials to enter any house, search for smuggled goods, and on suspicion seize what they might find. The argument against these writs was the first of many conspicuous acts of resistance to royal authority. In 1765 the Stamp Act, taxing many articles of daily use in the colonies, was passed by Parliament. Its principle was bitterly resented in Boston, where riotous outbreaks soon took place. A mob completely destroyed the house of Thomas Hutchinson, chief justice of the province, and was properly denounced by respectable citizens. In the next year the repeal of the act was joyfully celebrated by all classes. In 1770 occurred the "Boston Massacre" (q.v.), the result of friction between the inhabitants and the British troops stationed in the town. In the use of "a word which historians apply to such events as Cawnpore or the Sicilian Vespers" — the word "massacre" to describe "the careless shooting of half a dozen townsmen" — John Fiske finds "all the mildness of New England civilization brought most strikingly before us." The town-meeting was even more typical of this civilization, and from its training Samuel Adams, at about this time, stepped into virtual leadership of the revolutionary cause in Boston. The Committee of Correspondence was formed upon his motion, and out of it grew by degrees the union not only of towns, but of colonies, in their opposition to the throne. On 16 Dec. 1773, occurred the "Tea Party," a cleverly planned and executed plot for throwing into Boston harbor, by men disguised as Mohawk Indians, the cargoes of three vessels bearing tea upon which the people of Boston would not pay the hated tax. Parliament retaliated by passing the Boston Port Bill, which closed the harbor and brought the chief industry of the town, its maritime trade, to a standstill. A military governor, General Gage, took the place of Hutchinson, who had been acting as the chief civil magistrate, and open hostilities were at hand.

The events of 19 April 1775 — the warning ride of Paul Revere, the escape of John Hancock and Samuel Adams, the fights at Concord, Lexington and along the road between the two towns — are the commonplaces of American history. They belong to Boston in so far as the Boston revolutionary leaders were concerned in them, and as the British troops set forth from the town and returned to it defeated. The battle of Bunker Hill in Charlestown, 17 June 1775, bears much the same relation to Boston history. On 3 July Washington arrived in Cambridge and took command of the American army, which from that time until the following March kept the British closely within the lines of the siege of Boston. Many of the inhabitants were permitted early to depart. Those who remained suffered hardships and privations besides witnessing the destruction of much American property, and such scenes of destruction as the use of the Old South meeting-house as a riding-school. On the night of 4 March 1776 Washington made his memorable seizure of Dorchester Heights (now South Boston), and on the 17th Howe with all his army and a large following of American Tories sailed for Halifax. Thereupon Washington entered the city, and even before the signing of the Declaration of

Independence Boston ceased to be a scene of active warfare in the long conflict. Yet John Adams, Hancock and other Boston men bore an important part in the counsels of the young nation, in whose army and navy the town was fully represented.

The recovery from the effects of the siege was slow. To take the place of the departed Tories, and to occupy their spacious houses, there was in the remaining years of the 18th century a gradual immigration from the neighboring country (where Tories were few) of families possessing wealth, energy and qualities of leadership. Local government by town-meeting was resumed. In 1780 a State government for Massachusetts was formed, and John Hancock was chosen the first governor. In the general readjustment maritime affairs took their previous place of importance. Cut off by British legislation from the West India trade, the Boston merchants looked farther abroad. The prospects of the fur trade on the northwest coast of America became known through Captain Cook's journals, published in 1784. In 1787 two small vessels, the *Columbia* and the *Washington* sailed from Boston to attempt this trade. Before her return in 1790 the *Columbia* had circumnavigated the globe — the first of American vessels to accomplish this feat. The furs collected in the Northwest had been sold in China, and the example thus set led the way to an important trade with the East in which Boston long maintained the American supremacy. In such a seaport as Boston, Jefferson's Embargo and the War of 1812 were naturally unpopular. The Federalist party, moreover, had much of its best strength in Boston. The powerful mercantile class saw its best interests in a strongly centralized government and conditions of general stability. The opinions of this class colored the influential feeling of the community to an extent which laid Boston open to charges of something very near disloyalty to the national government. The crippling of commerce, however, had the good effect of turning capital and energy toward manufacturing. In 1814 Francis C. Lowell, of Boston, made the first American use of the power-loom in his mill at Waltham at almost the same time with its introduction into England. The growth of the great cotton industry at Lowell followed rapidly upon this invention. With the spread of manufactures Boston itself was growing. In 1820 its population was over 43,000. The old form of town government had become unwieldly. For some years efforts had been making toward the adoption of a city charter. In 1822 this was finally achieved.

From the time of this change in local government to the present, the outward growth of the city, as figures can speak for it, has been unbroken. In matters not computed in this way, the development has been in several important respects unique. With Boston, for example, the Unitarian movement in America is especially associated. Before the town became a city there were divisions among the clergy of Congregationalism — practically the established order in New England — on various doctrinal points, notably that of the Trinity. Under the leadership of William Ellery Channing the «liberal» clergy and most of the older and more influential religious societies turned from Calvinism to the new theology. Especially between 1820 and 1830, an acute controversy took place. Between 1840 and 1850 the Unitarian body itself was disturbed by differences between the more conservative element and the radicals, of whom Theodore Parker was a type. The result of the successive controversies has been a liberalizing of religious beliefs not only in what came to be Unitarian Boston, but in the many Protestant bodies which now acknowledge an important debt to Unitarianism. Another far-reaching movement which had its headquarters in Boston was that of anti-slavery. Here in 1831 William Lloyd Garrison established his journal, the *Liberator*. A year later the first anti-slavery society in America was established in Boston. The agitation of the Abolitionists was for a long time opposed to the conservative class, which resorted even to mob violence in the hope of suppressing the reformers. But to Garrison and his associates it was due, as Mr. J. F. Rhodes has said, «that slavery became a topic of discussion at every northern fireside.» When the Civil War broke out, the cause of the Union, perhaps even more than that of abolition, enlisted the enthusiastic support of the Boston community; yet, as if in fulfilment of the work which Garrison began, it was from Boston that Governor Andrew sent forth the first regiment of colored troops raised in the North.

With Boston and its immediate vicinity, moreover, are associated the names which stand for the most important contribution of the 19th century to American literature. Prescott, Ticknor, Bancroft, Motley and Parkman; Emerson, Hawthorne, Lowell, Longfellow, Holmes and Whittier,— these and their associates, bound together with many ties of sympathy and friendship, constituted a group of writers which gave the place a unique distinction in letters. The *Atlantic Monthly,* founded in 1857, became the vehicle for much of their most characteristic utterances. The influences of Transcendentalism (largely a local movement, culminating in the forties), of anti-slavery feeling, of creative expression, combined to give to this utterance as a whole something of the distinction which the individual writers won each for himself.

During the 19th century two important changes in the Boston landscape affected the future of the city, in the regions both of residence and of business. The first of these was the filling in of the Back Bay, an arm of the Charles River which spread between the Common and the hills of Brookline, running south and east as far as the Neck or narrow strip of land connecting Boston and Roxbury. From the early years of the century changes in the shore line of Boston had been wrought by cutting down the principal hills and filling out the irregularities of the harbor front. The first step in the series of events which led to the conversion of the Back Bay from water into land was the granting of a charter in 1814 to the Roxbury Mill Corporation, permitting the building of dams across the Back Bay and confining its water for mill purposes. To these rights the Boston Water Power Company succeeded in 1832. At about the same time the Boston & Providence and Boston & Worcester railroads invaded the Back Bay with their bridges. Moreover the waters became unsanitary through lack of drainage, and to solve the problem, hygienic and legal, a State commission was appointed and made a full report in 1852. Its recommendations to create the whole tract of land now known as the Back Bay did not at once satisfy the various conflicting interests, but in 1858 the actual work of filling up the waters was begun. The result was a large enrichment of the State treasury, and the addition to the city of the whole district occupied by the residences, clubs, churches, hotels and other institutions connected with the most prosperous life of the city. The original peninsula of Boston contained 783 acres. Through its encroachments upon water, largely in the Back Bay, it has grown to 1,829 acres. With the accessions of outlying districts, the total area of the city is now 29,158 acres.

The second great change in the outward aspect of Boston resulted from the great fire of 9 and 10 Nov. 1872. From the beginning of its history Boston had been afflicted by serious fires. This greatest of them all destroyed 776 buildings, all but 67 of which were of brick and stone. It devastated Summer street (both sides), Washington street from Summer to Milk, Milk street to the post office, Devonshire street, Water (both sides), Congress, Lindall and Oliver streets to the harbor. From the corner of Washington and Franklin streets the shipping at the wharves was in clear view. Nearly 2,000,000 feet of land were burned over. The total loss was estimated at more than $75,000,000. Yet by private enterprise and State aid the recovery was immediate. The opportunity to widen and straighten streets in the business district was seized. Statelier buildings rose in the place of those destroyed, and a new business region, corresponding to the new district of residences, was created.

The Metropolitan District.— He who would understand modern Boston must distinguish the city proper from the metropolitan district of which it is the centre. Where the Charles, Mystic and Chelsea rivers meet and flow into Boston Harbor, nature, materially aided by man, has formed three converging points of land. The northeastern, practically an island, is occupied by East Boston; the tip of the western is the Charlestown district; and the southern, out of which rises Beacon Hill, is the real heart, the business and administrative centre of Boston. South and west of this centre lie the South Boston, Roxbury and Dorchester districts. Inland on the southern bank of the Charles, and cut off from Boston by Cambridge on one side and the town of Brookline on the other, lies the Brighton district. These districts form the present city, a community whose population in 1915, according to the decennial State census, was 745,439, and whose total land area is 29,158 acres.

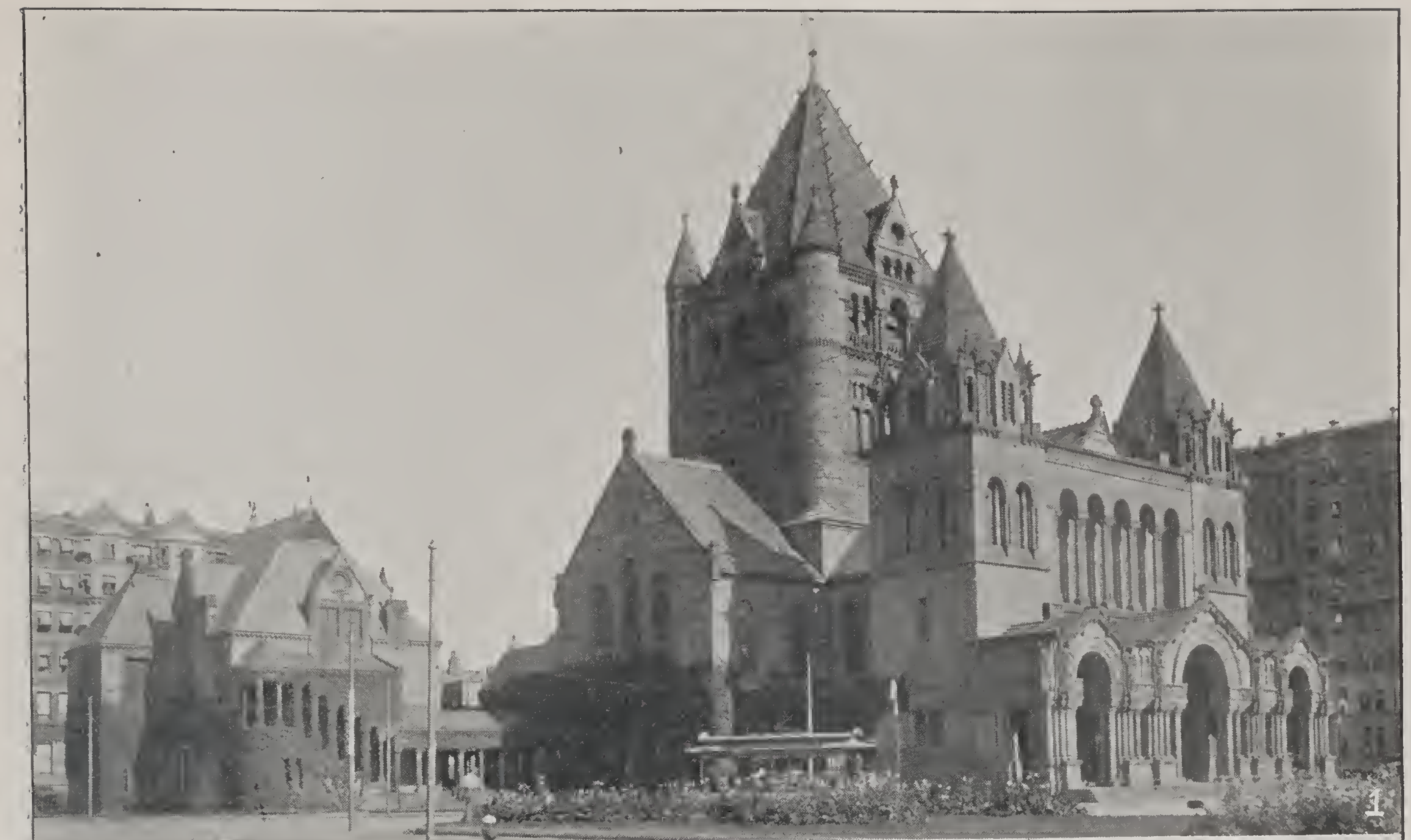
But this city, both in area and in population, is only part of the New England metropolis. The cities of Somerville and Cambridge reach almost to the centre of Boston; the independent town of Brookline is almost wholly within the city. The State enumeration made in 1915 put the population of the cities and towns lying within 10 miles of Boston at 942,480, giving the metropolitan district, as defined in the Federal census of 1910, a population of 1,687,919. Indeed, the State's centre of population lies within the metropolitan district.

Local Travel.— In this situation Boston faces a problem of the first order. Ferries, automobiles, steam and electric railways bring daily into the city thousands of these people. This fact can be easily illustrated. In the year ending 30 June 1914 the Boston, Revere Beach & Lynn Railroad, a narrow gauge suburban railroad, carried 13,817,292 passengers into and out of the city, or practically 7,000,000 each way, which equals more than 20,000 for each working day. In the same year the three leading railroads entering the city carried over 60,000,000 passengers into and out of the city, most of this business consisting of the transportation of «commuters,» who come to the city each day. The Boston Elevated system carried an even larger number into the cities and towns of the metropolitan district. These people from the suburbs come to work and to play. The city must provide transportation for them; it must clean its streets and regulate traffic for their convenience; it must give them police protection; it must educate many of them; it must be ready to serve their every want as if they were citizens. Ample evidences of these facts may be found in school, hospital and police records. Over one-third of the persons arrested annually in Boston do not have their residences in the city.

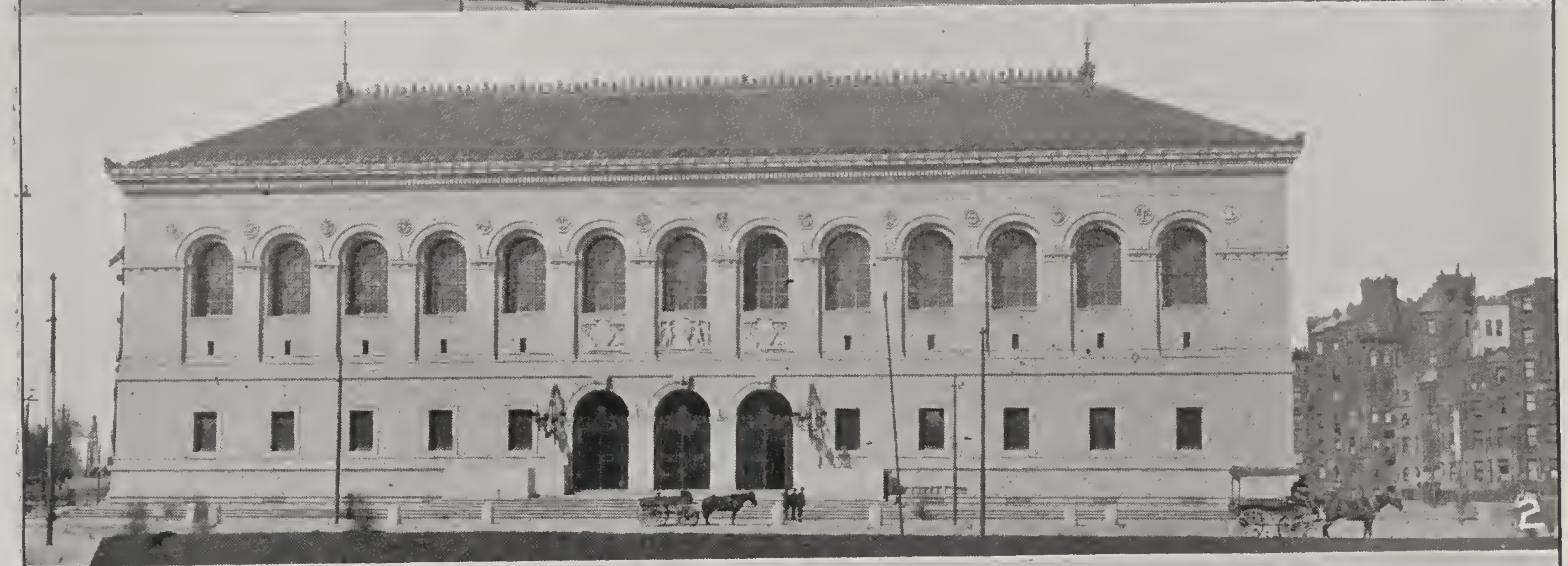
On the other hand, this condition has its compensations for the city. The commerce and industry of the city are thereby greatly increased. This, in turn, has its effect on property values. The assessed valuation of real estate in Boston in 1914 was $1,237,473,100, of personalty, $312,573,509, total over a billion and a half. This equals a per capita assessed valuation of $2,061.84, which exceeds New York's per capita valuation by almost $300 and every other city in the country by over $600.

Population.— The population of the city proper has grown steadily since 1790. Immigration and the annexation of other towns have probably been the most important factors in this growth. In 1790 Boston had 18,320 people; in 1810, 33,787; in 1830, 61,392; in 1850, 136,881; in 1870, 250,526; in 1890, 448,477; in 1910, 670,585; and in 1920 (U. S. Census) 748,060. Immigration has been largely from Ireland. Following the famine in Ireland in the 40's, a considerable stream of Irish immigration set in toward the United States, and much of it found its way to Boston. In 1846, when the city is said to have had about 120,000 people, there were already about 24,000 Irish among the population. This stream of incomers continued through the century, until the home of the Puritan and the birthplace of Unitarianism has come to be dominated politically by the Irish-Americans. In 1910 there were in Boston over 150,000 persons of Irish birth or Irish parentage. To be sure, other nations have also contributed to Boston's foreign population, especially in recent years. In 1910, 69,000 of its people were of Canadian birth or parentage, less than 5,000 of these being French-Canadian; 19,000 were of English birth or parentage; 19,000 German; 49.000 Italian; and 63,000 Russian, mainly Jewish. In addition there were thousands of persons in the city one of whose parents was of foreign birth. All told, less than 25 per cent of the people of Boston in 1910 were native born of native parentage and many of these could claim but

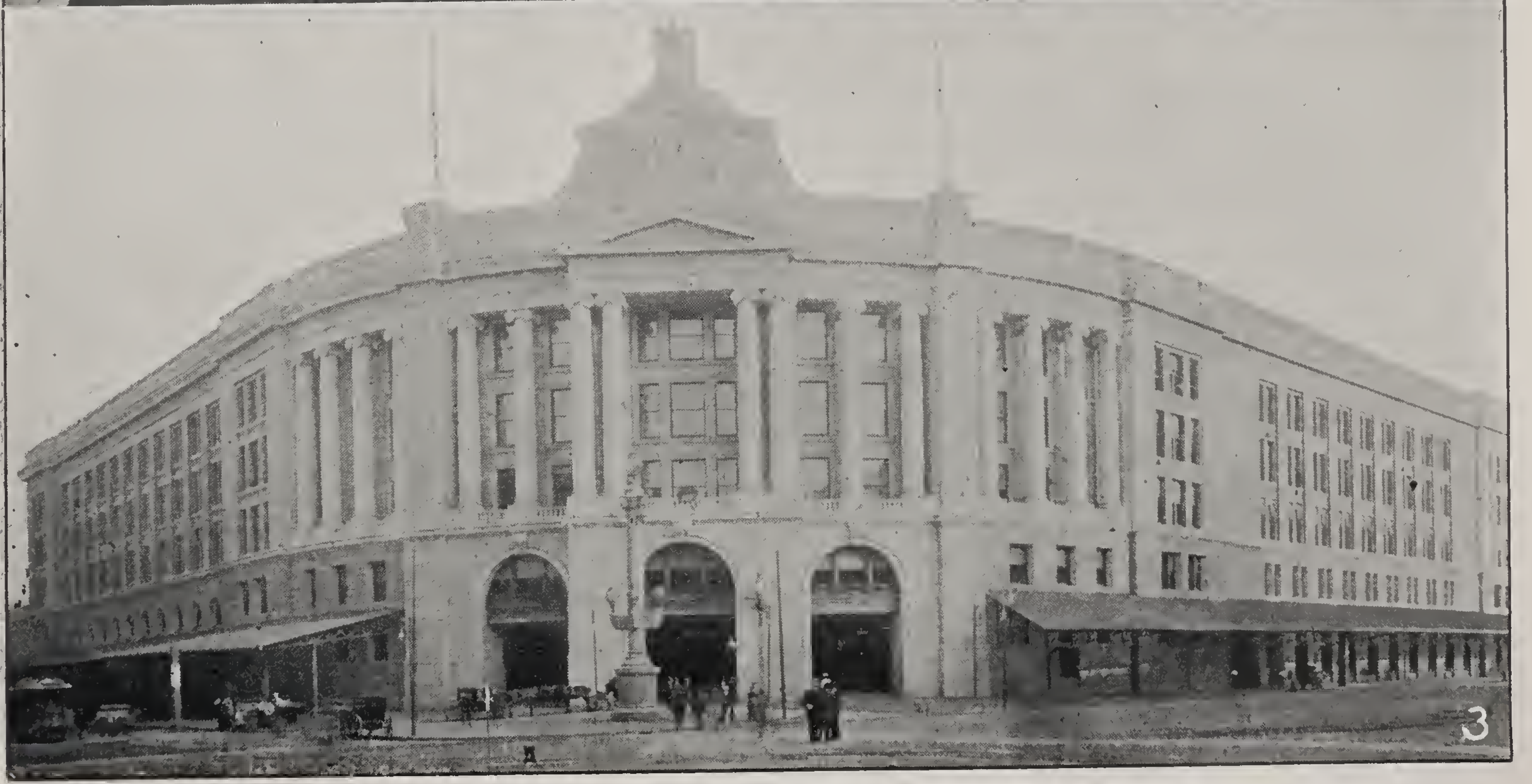
BOSTON, MASS.



1 Trinity Church

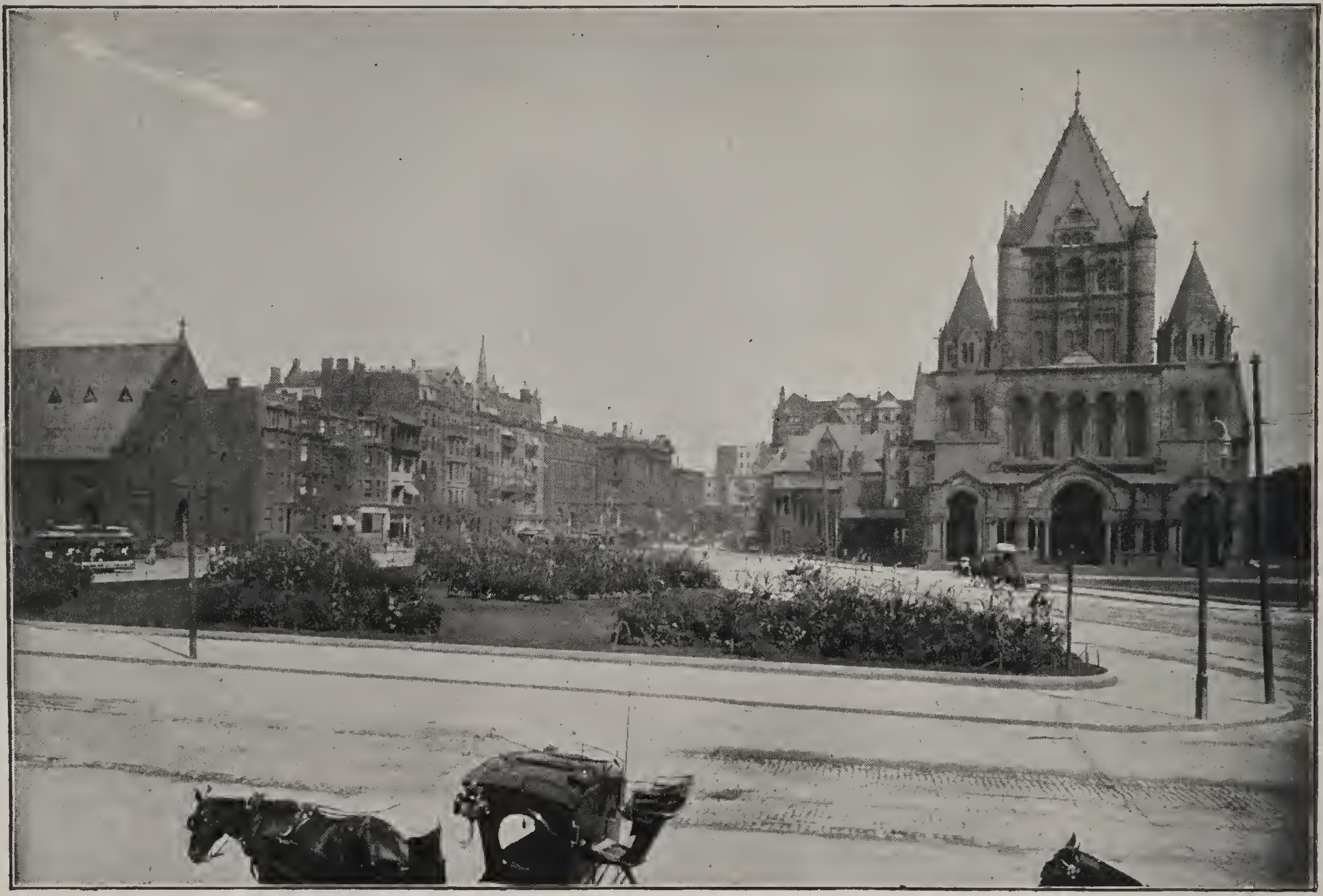


2 Public Library



3 South Station

BOSTON, MASS.



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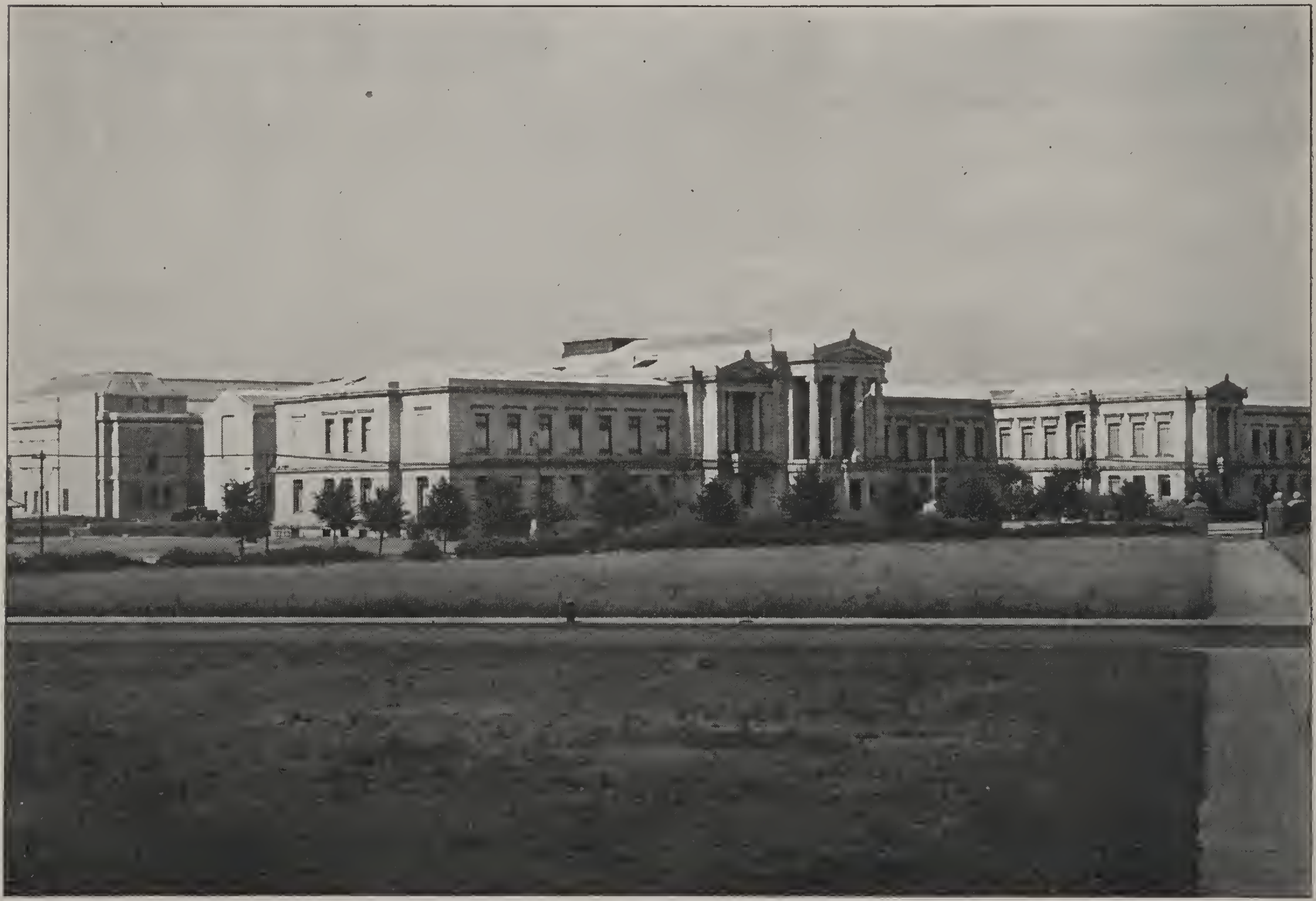

MUSEUM OF FINE ARTS

a single generation of American parentage behind them.

Churches.— Church statistics go far to confirm these figures, for of 345 churches of all denominations listed in the city directory of 1915, 65 were Roman Catholic and 38 Jewish. Among others, the Baptist denomination had in the same year 35 churches within the city; the Congregational-Trinitarians had 36; the Congregational-Unitarians, 24; the Methodist Episcopal Church, 31; the Lutherans, 12; the Presbyterians, 11; and the Episcopalians, 36. When one considers the history of New England, these statistics are, indeed, surprising. Among the various other denominations which have a footing in Boston is the Christian Science Church, whose temple, or mother-church, is one of the architectural landmarks of a city which boasts many famous and beautiful buildings.

Commerce.— With the growth and diversification of the population has come a corresponding increase in commerce and manufactures. Boston is not a city of one dominant manufacture, nor is its import and export business highly specialized in one line. Nevertheless, in the manufacture of boots and shoes, clothing, pianos and organs and a number of specialties, Boston is one of the leading cities of the Union, and as a wool market it stands first. The United States census of manufactures for 1914 recorded 3,138 industrial establishments of factory grade, employing 96,913 persons, of whom 78,894 were wage earners, receiving annually in wages $49,444,000. The capital invested aggregated $214,735,000, and the year's output was valued at $284,802,000: of this, $134,234,000 was the value added by manufacture.

The port of Boston is firmly established as the chief port of New England and as one of the largest in the United States. With exports of $71,961,259 and imports of $162,998,471, total $234,959,730, Boston's foreign trade in 1914 was surpassed by that of only two other American cities, New York and New Orleans. The tonnage of vessels in foreign trade which entered and cleared in the year 1913 was over 5,000,000, in 1914 slightly under 5,000,000. The coastwise trade was also considerable, as was the number of passengers coming and going on the steamship lines which make regular sailings from the port.

Boston's rank among American cities was officially summed up in 'Boston Statistics, 1915,' as follows: "First in value of property per capita, first in municipal assets per capita, first in banking power per capita, the first shoe and leather centre, the first wool market, the second importing seaport, the second textile centre, third in foreign trade, also in amount of bank clearings, the fourth postal district, fourth (close to third) in total assessed valuation, fourth (probably) in population, the fifth exporting seaport, and seventh in the value of its manufactures."

Transportation.— A few words should be said about the transportation and terminal facilities of Boston. There are two main railroad stations in the city, the North and South stations. Into the former come all the trains of the Boston & Maine system, which covers especially northern Massachusetts, New Hampshire and Maine. Passengers on the Boston & Maine to and from Boston in the year 1913–14 numbered over 25,000,000. The South station, reputed to be the largest railroad station in the world, is the main terminal for two railroads, the Boston & Albany, now a New York Central line, and the New York, New Haven & Hartford. This station handles annually even more passengers than does the North station. Within the city Boston has an excellent system of elevated, surface and sub-surface electric railways, now under the single management of the Boston Elevated Railway Company and giving both local transportation and rapid transit into adjacent cities and towns. The subways are owned, and were built, by the city, sometimes in co-operation with other cities, and are leased to the Boston Elevated company at fixed annual rentals. There are now many miles of subway and extensions are continually being made. Without subways and elevated lines, the older parts of Boston would be hopelessly congested during the rush hours of the morning and evening.

With the new century, Boston awoke to the necessity of developing her harbor facilities to more efficiently handle the growing commerce. In the past 15 years the Federal, State and city governments have co-operated on a scheme of development, which, though held up at times by unforeseen delays, has gone steadily on toward the goal of completion. One of the main channels of the harbor has been deepened and widened; an immense drydock has been constructed; several large new piers have already been completed, at an expense of millions of State money; and still other works are in process. When this work shall have been all completed and the two main railroad stations more closely linked up with one another and articulated with the means of local transportation, especially the Boston Elevated system, Boston will have solved its chief transportation and terminal problems for some years to come.

Points of Interest.— The city and its environs offer to the visitor and sightseer a variety of points of interest almost if not quite unequaled in an equal space anywhere in the United States. The city and the State have taken care to preserve many of the more famous buildings of an earlier day. Among those which remain are the Old State House and Faneuil Hall, dating from 1748 and 1742, respectively, and a group of the old meeting-houses, including Christ Church (1723), the Old South Meeting-house (1792), and King's Chapel (1749). In the Navy Yard in Charlestown lies the old frigate *Constitution,* exemplifying the preparedness of another day. Bunker Hill, its monument, and Dorchester Heights are all within the present city limits.

Changes.— In growing from a town to a metropolis, Boston has undergone fundamental changes, perhaps not all for the better. Like most American cities, it suffers from much bad architecture. But since the middle of the last century and especially in the past 30 years, many improvements have been made in the appearance of the city. The old part of the city still suffers from crooked, narrow, poorly-planned streets, some steep grades and other hindrances to traffic, but with the filling in of the Back Bay district, the city took the first step toward the development of a real city plan. Ample width was given to the streets and the blocks were laid out on the rectangular plan. Later the Fenway district was made a place of architectural beauty by the locating in it of the Museum of Fine Arts, the Harvard Medical School and other buildings of note. Elsewhere in the city there have been other acts of replanning, as at Copley Square, upon which fronts the splendid Public Library. In 1913, by the erection of the Custom House Tower, the skyline of the city was entirely changed; this splendid tower of stone-masonry, standing in the business district and close to the wharfs, rises high above the buildings in its vicinity and can be seen from afar on all sides of the city. A building-heights law prohibits other buildings from even approaching it in height. No enumeration of the better buildings about Boston would be complete which did not mention the State House, which stands on Beacon Hill, fronting the Common, and has been greatly enlarged since its original "Bulfinch Front" was built in 1795–97.

Parks, Playgrounds, etc.— The parks and playgrounds movement may fairly be said to have had its beginning for Americans in Boston. The city still stands at the head of those communities which have actually achieved their aims in this direction. There are within the city 3,574 acres of land devoted to park and playground purposes, over one-tenth of the total land area of the city. Of this area, 2,692 acres are under control of the city and 882 acres under control of the State. The Common, with an area of 48 acres, and the Public Garden, with an area of 24 acres, lie almost at the centre of the city. No district is without its park or its playground, no part of the community without an easily accessible breathing spot. Yet here again we must consider not Boston alone, but the metropolitan district. A State-appointed Metropolitan Park Commission has developed in the environs of the city a supplementary system of parks and reservations which is perhaps the most complete in America. Almost every part of the whole system can be reached from any part of the city on payment of a five-cent fare. North of the city lies the Middlesex Fells Reservation, containing over 3,000 acres of woodland and hills. South of the city lies the Blue Hills Reservation, containing 4,232 acres. The ocean beaches north and south of the city have been preserved and equipped with bathing facilities. Both banks of the Charles River have been included in the general scheme for a number of miles inland. And finally, all the important units in the system have been linked up one with another by means of a system of well-kept boulevards. Indeed, in every respect, in planning as well as in maintenance, in the equipment of playgrounds and the provision of bathing facilities and in the more especially educative features provided at the Marine Park, the Franklin Park Zoo and the Arnold Arboretum, the park system of Boston and of the metropolitan district may be said to be excellent.

Education.— The facilities offered by the city for education in all the arts and sciences are ample and of high order. At the base lies an extensive system of kindergartens and primary grade schools, above which are the grade schools, junior high schools and high schools. In addition there were in 1914 30 night schools of all grades, with 451 teachers, 77 playgrounds with 133 instructors, 87 school physicians and 35 school nurses. The total number of teachers in day schools was 3,108, of whom 451 were men. The cities of Massachusetts have a large amount of local autonomy in school affairs and Boston has made full use of this privilege. The city spends already $6.89 per capita for the support of schools, therein leading all the cities of the United States, and would undoubtedly spend more were there not legal restrictions on the amount which may be spent for school purposes. Indeed, this financial restriction upon the powers of the city has had the bad effect in the last few years of necessitating a larger number of pupils per teacher, the ratios in 1914 being 43 to 1 in the grade schools, 29 to 1 in the high schools and 26 to 1 in the kindergartens. The annual expenditures for all purposes in 1914 were $84.69 per attending pupil in the day high schools and $41.36 per attending pupil in the day elementary schools.

The city itself offers no higher education except through its library, which now has over 1,000,000 volumes in its collection and maintains 30 branch libraries and reading-rooms. It circulates annually over 2,000,000 volumes. Instruction in the arts is given by the School of Drawing and Painting, housed in the Museum of Fine Arts, and in music by the New England Conservatory of Music, as well as by a number of other schools and private teachers. Boston University (q.v.) is within the city limits and just across the river lies Cambridge, which has been the seat of Harvard College, now Harvard University (q.v.), for nearly 300 years, and to which the Massachusetts Institute of Technology (q.v.) is moving in 1916. The Lowell Institute, founded in 1838 with an endowment of $237,000, offers each year a number of courses of free lectures of a high order. The Boston Symphony Orchestra has already educated a large group of people to an appreciation of the best in music.

Legislation.— The constitution of Massachusetts puts almost no restrictions upon the power of the legislature to make laws for cities. The legislature, meeting annually in the city of Boston, and observing the rising importance of the metropolis in the affairs of the State, has seen fit to keep in its own hands almost the whole legislative power in the city's affairs. The legislature enacts each year a large number of bills for the government of Boston alone or for the metropolitan district. In 1897 it was asserted that in the past 75 years the legislature had passed 532 special acts affecting the city or the towns which have been annexed to it; another count showed over 400 from 1885 to 1908. The number of such special acts seems to increase rather than decrease. Some affairs have been taken entirely out of the control of the city, such as the police department. The State legislature is, in a real sense, the chief governing body of the city.

Government.— Boston had no charter as a city until 1822, when its population was already approaching 50,000 and town government was no longer possible. Between 1822 and 1909 the city had many minor changes of government, but it was through a large part of that period governed by a mayor with little power, a small board of aldermen and a large council. From the first the mayor was an elective officer and the tendency was for his powers to increase at the expense of those of the council. The large, double-chambered council came to be thoroughly discredited because of its inefficiency and its tendency to play politics. In 1909, following an investigation of the financial methods and condition of the city, the legislature enacted a new charter framed by a committee of citizens, which gave more power and responsibility to the mayor, and substituted for the old unwieldy council a body of nine men elected at large for three-year terms. The mayor now serves a four-year term, but may be recalled at the end of his second year. His salary is $10,000 annually. He has extensive power over the annual budget, for the council only may reduce it, and that only upon a two-thirds vote. His appointments to the chief places in the administration require no aldermanic confirmation, but may be rejected by the State Civil Service Commission. Most minor positions are filled under civil service rules laid down by the State commission. Members of the council receive $1,500 per year. As a body they may reduce the budget and they have also the ordinance power, including the power to create and to abolish city departments.

The city's school system is under two boards. The school committee, composed of five members elected at large, has charge of the curriculum and the staff of teachers. The schoolhouse commission, which has charge of the physical plant and the erection of new buildings, is composed of three members appointed by the mayor.

Elections come annually. Nominations are by petition. At present 3,000 signatures of bona-fide voters are required to nominate a candidate for the mayoralty, 2,000 signatures for a place in the council or on the school committee. The nominations and the elections are non-partisan, Boston being the first large city in the country to use this feature, and second only to San Francisco in the system of election at large for the council.

Problems of government and administration in Boston are in a number of cases of deep concern to more than the city. Many of them are truly metropolitan problems. For this reason the legislature of the State has deemed it wise to take out of the hands of the city government, as such, the control of the police, the water supply, the main drainage system and the park system. Each one of these departments is controlled by State-appointed officers, and their annual budgets are practically mandatory upon the city. The police system has at its head a single commissioner appointed by the governor for a five-year term. His police jurisdiction extends only to the bounds of the city proper. Parks, water supply and the main drainage and sewerage system are under State commissions whose jurisdictions cover more than the city, including, indeed, many cities and towns in the metropolitan district.

The city is thus hedged about on all sides by the control of the State. It has also been compelled to assume a very large portion of the metropolitan debt. On 1 July 1914, the city was carrying 77 per cent of the metropolitan water debt, 59 per cent of most of the park debt, 43 per cent of most of the sewer debt and also some minor debts of the larger district, the total metropolitan debt borne by the city being over $35,000,000. On 1 Feb. 1915, the total net debt of the city was $81,974,576, or about $110 per capita. The city of New York alone among American cities exceeded this per capita indebtedness. This rising tide of municipal indebtedness, coupled with a steady increase in the annual payments for current expenses, has recently given people both within and outside the city the idea that Boston is the most expensively governed city in the United States. In 1913 the per capita payments for all governmental costs amounted to $45.06. New York, with per capita expenditures of $46.78, was the only American city to exceed Boston in expenditures. The average for all cities of over 500,000 population was $37.56. When put upon a basis of expenditures per $1,000 of assessed valuation, Boston and New York both make much better showings, Boston's being even better than New York's. The tax rate in 1914 on 100 per cent valuation was $17.50, of which $13.57 was for municipal purposes. Over $24,000,000 of the net debt of the city is for rapid transit purposes, mainly subways, and is self-paying. Nevertheless, when all possible deductions and allowances are made, the city's financial operations during the past 20 years have laid themselves open to much criticism. From 1903 to 1907, inclusive, public borrowings increased by almost $6,500,000 annually. These criticisms bore fruit in 1907 in the creation of the finance commission, which was in 1909 made a permanent State commission, though the city continues to pay the bills. This commission has done a great deal to point out defects in the city's financial operations and its reports are of considerable value to the student of municipal government. It serves also to educate the more intelligent among the voters. It was the work of this commission in its first two years which brought about the important changes in the government of the city which were effected in 1909.

M. A. De Wolfe Howe,
Author of 'Boston: the Place and the People.'

BOSTON, a game of cards played by four persons, with two packs of cards. Counters are used generally of three colors and values, and each hand is settled for as soon as finished. The entire first pack is dealt out by fours and fives, and the second pack is cut for trump, the suit of the card turned being «first preference,» the other suit of the same color «second preference,» and the other two «plain suits.» If the first player can make five tricks, he says, «I go to Boston»; and his competitors may overbid him by saying, «I go 6, 7, 8, 9, 10, 11, 12 or 13,» as the hand of each may warrant. Should either of them fail to make the number of tricks he «bids» for, he must pay to each competitor a forfeit regulated by a card of prices, which must be prepared beforehand. Without such a card Boston cannot be played. He may also bid to lose twelve tricks, after discarding one card that is not shown, which bid is called «little misère»; or to lose all tricks, which is called «grand misère.» If he wins all tricks it is a «grand slam.» Players who do not bid the first time may outbid the others only in «misères.» If a player should take more tricks than he bids for, he is paid for the extra tricks, but on a lower scale than if he had bid and taken the higher number of tricks. If no bid should be made, a «misère partout» is played, the trump being turned down, and each player trying to take as few tricks as possible. It is one of the most complicated of games. It is said to have been introduced into France by Dr. Franklin, who gave it the name of his native city.

BOSTON AND ALBANY RAILROAD. See New York Central Railroad.

BOSTON CASE, in the history of slavery, a case where a Georgia slave hid or was hidden on the ship *Boston* returning from Georgia to Maine and on her arrival escaped to Canada. The governor of Georgia issued a requisition to the governor of Maine for the surrender of the captain to the Georgia authorities as a slave-stealer and fugitive from justice, and on his refusal the Georgia legislature demanded that Congress pass a law obligating the governor of Maine and all others in similar cases to comply with the requisitions. The resolution was never reported on. In his next message the governor of Georgia recommended that «all citizens of Maine who should thereafter come within the jurisdiction of Georgia on vessels, either as owners, officers or mariners, should be considered to have done so with intent to commit the crime of seducing negro slaves from their owners and be dealt with accordingly by the officers of justice.»

BOSTON CORNER. See Boundaries of the United States.

BOSTON AND MAINE RAILROAD. The Boston and Maine system, as it stands to-day, is one of the most remarkable examples of railroad evolution and consolidation to be found in the world. Including the constituent roads owned, leased, controlled and operated, it represents fully 125 distinct units, ranging from a four or five-mile line, like the Troy & Bennington, to a great 400-mile «system,» like the Fitchburg division. Some of its branches were incorporated as far back as the early thirties, while others are creations of the last 15 or 20 years.

To bring together all of these different and sometimes conflicting transportation units under a single management represents a feat of financiering probably unique on this continent. Of the 2,302 miles now operated by the Boston & Maine Railroad no less than 1,544 miles represent roads leased by the parent company. One of these, the Troy & Bennington, is leased in perpetuity, and the lease having the longest term to run is that of the Vermont & Massachusetts road, which expires in 2873. The Massawippi Valley road lease expires in 2869, the Fitchburg road lease in 1999, and the one to first expire was that of the Suncook Valley road, 1 Jan. 1916.

To give a clearer idea of the full extent of the Boston & Maine Railroad system the following table, showing the leased roads, with the dates of their incorporation, the beginning and expiration of leases, and mileage has been prepared under the direction of Vice-President William J. Hobbs:

Name of Road	Date of Incorporation	Date of Lease	Date of Expiration	Miles of Road
Lowell & Andover	Feb. 5, 1873	Oct. 18, 1875	Dec. 1, 1973	8.85
Kennebunk & Kennebunkport	Aug. 16, 1882	June 18, 1883	May 15, 1982	4.50
Manchester & Lawrence	June 30, 1847	June 1, 1887	Sept. 1, 1937	22.39
Boston & Lowell	June 8, 1830	June 22, 1887	April 1, 1986	111.27
Nashua & Lowell	April 16, 1836	Nov. 10, 1880	Oct. 1, 1979	14.50
Stony Brook	March 26, 1845	Sept. 30, 1884	Jan. 1, 1989	13.16
Wilton	Dec. 28, 1844	Feb. 1, 1884	Oct. 1, 1982	15.50
Peterboro	July 7, 1866	April 1, 1893	April 1, 1986	10.50
Northern	Dec. 27, 1844	Dec. 30, 1889	Jan. 1, 1989	172.32
Connecticut & Passumpsic	Nov. 10, 1835	June 1, 1887	Jan. 1, 1986	110.30
Massawippi Valley	1862	Dec. 27, 1871	July 1, 2869	27.46
Connecticut River,				
Northampton & Springfield	March 1, 1842	Jan. 1, 1893	Jan. 1, 1992	88.36
Greenfield & Northampton	Jan. 25, 1845			
Concord & Montreal,				
Concord railroad	June 27, 1835	June 29, 1895	April 1, 1986	339.47
Boston, Concord & Montreal	Dec. 27, 1844			
Concord & Portsmouth	1845	May 26, 1862	Jan. 1, 1961	39.87
Suncook Valley	July 1, 1863	March 11, 1870	Jan. 1, 1916	17.41
Pemigewasset Valley	July 9, 1874	March 31, 1883	Feb. 1, 1982	22.93
New Boston	Feb. 19, 1891	June 21, 1893	June 19, 1992	5.19
Franklin & Tilton	Aug. 4, 1887	Oct. 8, 1895	April 1, 1986	4.95
Fitchburg	March 3, 1842	June 30, 1900	July 1, 1999	394.14
Vermont & Massachusetts	March 15, 1844	Jan. 1, 1874	Jan. 1, 2873	58.58
Troy & Bennington	March 27, 1851	Oct. 12, 1872	Perpetuity	5.04
Total mileage	....	....	....	1487.69

While it is impossible to give anything like a complete history of such a complicated system as that of the Boston & Maine Railroad in such a brief sketch as this must be, it is important to note some of the events in its history which stand out most conspicuously. For example, it is certainly worthy of record that the original railroad — the acorn from which the present great Boston & Maine system has sprung — was first conceived in the brain of its founder, Hobart Clark, of Andover, Mass., in the fall of 1832.

Mr. Clark, after traveling over the Albany & Schenectady Railroad, then the only line west of the Hudson River, saw the utility of a branch railroad to Andover, tapping the Boston & Lowell road (then under construction) at Wilmington.

The road was, in 1833, granted a charter under the name of the Andover & Wilmington Railroad, the first directors being Hobart Clark, Abraham Marland, Amos Abbott, John Smith and Merrill Pettingill, all residents of Andover. The capital stock was $100,000.

Hobart Clark was elected president, and the road was surveyed under the direction of Col. Loammi Baldwin, of Charlestown, Mass., the well-known civil engineer.

Work was commenced in the spring of 1835, and the first section of the road was opened to Andover 6 Aug. 1836. By the fall of 1837 it had been opened to the Merrimac River, at Bradford; by 1840 to Exeter; by 1841 to Dover and by 1843 to South Berwick Junction.

In 1835, a second charter had been obtained allowing the extension of the road to Haverhill, and the name was changed to the Andover & Haverhill Railroad; and a little later in the same year a charter was obtained from the New Hampshire legislature for a road from the Massachusetts line through New Hampshire to the Maine State line, under the name of the Boston & Maine Railroad.

In the following year the Maine legislature granted a charter extending the line to Portland, and thus was finally organized the original Boston & Maine Railroad, which to-day serves a very large section, annually transports over 43,000,000 passengers and nearly 23,000,000 tons of freight, earns $46,405,035 a year, owns 23,900 freight cars and 1,953 passenger cars, carries a veritable army upon its payrolls, and operates in five States and one Canadian province.

The system had its beginning in the day of small things, and to-day it exists in an era of great ones, as far as railroad policies are concerned.

The slow but certain process of amalgamation which has resulted in the present vast transportation system under one management has been an exceedingly interesting one, but its history would require too much space to be given even in outline here.

It has been attended by many exciting episodes, legislative and financial, particularly with reference to the leasing of the Connecticut River road in 1893, the Concord & Montreal in 1895 and the Fitchburg in 1900. These leases were hotly contested by minority stockholders or opposing interests, but most of the leased lines were absorbed without much show of opposition. It has for some time been the policy of the company to purchase outright its leased lines, whenever that has been practicable. In view of the present highly-organized condition of railroad operation it is noteworthy that when the original Boston & Maine road was first built and operated the telegraph had not been invented and double tracks were essential for the safe operation of trains.

Moreover, civil engineering was then in its infancy and surveying instruments were clumsy and primitive, the transit not even having been produced at that time.

Few of those who were engaged in building the road had ever had any experience in such work, for railroads themselves were very new then, and there is a tradition that fully 75 per cent of the surveying for the line was done without instruments and by purely visual work. There were no time fuses to aid in blasting, and not even friction matches had come into existence.

Aside from the relocation of a part of the Central Massachusetts division, made necessary by the construction of the great Wachusett reservoir, the only considerable piece of railroad in the territory now controlled by the Boston & Maine which has ever been actually abandoned was part of the original Portsmouth & Concord road. This line once ran between Suncook and Candia, and that portion of it was afterward given up for a more favorable location.

According to the financial report issued by the company for the year ending 30 June 1910 the total earnings of the road during the previous 12 months were $43,357,175. Deducting operating expenses, $31,336,324, left the net earnings $12,020,851, an amount that was further increased to $12,809,863, by the addition of $789,012, which represented the road's income from other sources.

The report for the year ending 30 June 1915 showed a total operating revenue of $48,430,485 against total operating expenses $37,270,726, leaving net earnings of $11,159,759. Other expenses and deductions, however, revealed a net loss of $476,440. This, nevertheless, improved on the year preceding, 1914, when the net loss revealed was $2,169,554. A new board of trustees appointed 17 Oct. 1914, after a study of the situation, found that the trouble was fundamental and suggested its correction by slight increases in freight and passenger rates and by a financial reorganization, which would keep the system intact as a whole and restore its credit.

BOSTON MASSACRE, a riot in Boston, 5 March 1770, provoked by the British regiments quartered there. On Friday the 2d, some rope-makers started a war of insults with passing soldiers and on being challenged to a boxing match, used sticks instead, to which the soldiers retorted with cutlasses; several persons were hurt when the fray was stopped by outsiders. Early Monday evening the soldiers passing to their posts from the main guard, at the head of King (State) street, were met by a crowd armed with canes and sticks, who refused to make way and shouted insults; the soldiers were about to force a passage when an officer came up and ordered them into the yard, but the alarm-bell had called out the citizens; the hot-heads wished to assault the main guard, and apparently they and the boys set to harrying the sentinel in front of the custom-house opposite the main guard, who about 9 o'clock hit a specially annoying boy with the butt of his musket. The boy ran off and brought a crowd to the spot, headed by one Crispus Attucks (q.v., apparently a half-breed Indian), and pointed out the sentinel, at which they shouted, «Kill him! Knock him down!» The sentinel retreated up the steps and loaded his gun amid a shower of snowballs and other missiles; told Henry Knox, who was passing and counseled him not to fire, that he would if they touched him; leveled the gun and warned off the crowd, and called for help from the main guard across the street. A sergeant and seven men were sent to his help and he came down and took his place in line; soon afterward Col. Thomas Preston joined them, making 10 in arms. They loaded; the crowd jeered, hooted, taunted them as cowards, dared them to fire and closed about them; the soldiers drove them back with clubs and bayonets; Preston, in turn warned by Knox, rushed among his men, and either with or without his orders they fired, killing Attucks and two others and mortally wounding two more. The crowd fell back and Preston prevented the men firing again and rejoined the main guard. The drums beat to arms and the vicinity was soon thronged with divisions of soldiers and masses of enraged citizens. Lieutenant-Governor Hutchinson quieted the tempest by having Preston bound over to trial, placing the implicated soldiers under arrest and inducing the officers to order the companies back to barracks; but the next day a town-meeting forced Hutchinson to have the regiments removed to the Castle in the harbor. Preston was tried in October and the soldiers in November before the Superior Court and defended by Robert Auchmuty, assisted by John Adams and Josiah Quincy, who took their futures in their hands from professional duty. Preston was acquitted, six soldiers were brought in not guilty and two found guilty of manslaughter, branded in the hand and discharged. There is much difference of opinion with respect to the massacre, some regarding it as a lawless affair and some as the «first act of the Revolution.» The day was annually commemorated in Boston until 1783, and in 1888 a monument was erected to the memory of the 10 victims. Consult Kidder, ‹History of the Boston Massacre› (Albany 1870), and Winsor, ‹Memorial History of Boston› (Vol. III, Boston 1880–81).

BOSTON MOUNTAINS, a range in western Arkansas, extending into the Indian Territory; highest summits 3,000 feet above the sea.

BOSTON NEWS LETTER, the first real newspaper of America, edited by John Campbell (q.v.), a Scotch bookseller and postmaster of Boston, who had been actively writing and sending «news letters» of European occurrences to New England governors for a year or more and thought it would save trouble to print them for all. With official permission he issued on 24 April 1704, the first number of a weekly consisting of a single leaf, 8 x 12, printed on both sides and dated «From Monday, April 17, to Monday, April 24, 1704.» It was printed by Bartholomew Green, for many years one of the best printers of Boston, who in 1722 became its editor. Dying in 1732, he was succeeded by his son-in-law, John Draper, who conducted it till his death in 1762 and made it a representative of the best interests of the province; he was a journalist of the highest character. His son, Richard Draper, considered the best news compiler of his day, though in feeble health, edited the paper till his death in 1774, when his widow succeeded him and carried it to the end. Draper had been an ardent loyalist and firmly supported the mother country in the stormy times of the previous decade; his widow naturally shared his feeling, and when the young man, Robert Boyle, whom she installed as editor, showed sympathy with the Revolution, she replaced him by John Howe, who conducted it till the British evacuated Boston, 17 March 1776, when he and Mrs. Draper left with them and the paper ceased to exist. The British government gave her a life pension. There are only three copies of the first number extant: in the Massachusetts Historical Society at Boston, the American Antiquarian Society at Worcester, Mass., and the New York Historical Society at New York. A facsimile of the first page is given in the ‹Memorial History of Boston,› Vol. II, page 389. See American Newspapers. Consult Weeks, L. H., Bacon, E. M., ‹An Historical Digest of the Provincial Press 1689–1783› (Vol. I, Boston 1911).

BOSTON PORT BILL, of 31 March 1774, was Great Britain's retort to the destruction of the tea in Boston Harbor, 16 Dec. 1773. (See Boston Tea Party). The maintenance of English authority by force, or abdication in favor of a party which would maintain it, were the only alternatives left to the government. The King's Speech of 7 March 1774 charged the colonists with attempting to injure British commerce and subvert the Constitution, and on the 18th Lord North brought in the Port Bill, providing that there should be no further «landing or discharging, lading or shipping of goods, wares and merchandise at the town and within the harbor of Boston» till the town paid for the tea and promised submission to the laws; that the colony's seat of government should be removed to Salem and Marblehead made a port of entry, the act to take effect 1 June. Even some of the best friends of America in Parliament at first approved it as moderate and reasonable, as the town could end the punishment at any moment by paying for legitimate merchandise destroyed by riot and allowing law and order to have their course; but the Whig opposition soon collected itself and the bill was fought in its various stages by Burke, Barre, Pownall and others. In spite of them it became a law 31 March, without a division in the Commons and by unanimous vote in the Lords. The fleet and army were, of course, to join in enforcing the blockade; Boston was filled with troops and Gage made commander-in-chief. The immediate results were a flood of contributions from the other New England towns, of grain and provisions, so great that the Boston leaders boasted that it would become the chief grain port of America if the act were not repealed; and finally a general congress, the first Continental Congress, was called to discuss this and other obnoxious acts passed in the same year and to devise measures of relief. Consult Frothingham, ‹Rise of the Republic› (Boston 1872); Pickering, ‹Statutes at Large› (Vol. XXX, London 1842); Halsey, ‹Boston Port Bill› (New York 1904).

BOSTON TEA PARTY, 16 Dec. 1773. Till shortly before the Revolution, imported teas paid a shilling a pound duty at English ports, but the merchants received a drawback of three-fifths on exports to the colonies, who were charged the remaining 4⅘d. in the selling price. As they obtained it more cheaply by smuggling from Holland, there was no English tea trade. In 1767, as part of a series of duties to raise revenues for paying the colonial executives and judiciary, to make them independent of popular control, this duty was reduced to

3d., but to be collected at American ports. This was done with the threefold object of aiding the straitened East India Company to market its tea, substituting a small collectible duty for a larger uncollectible one and helping to break up the illicit free-trade which was the life of the colonies. The political purposes made Americans invincibly hostile to it. Associations were formed to abstain from the tea, merchants who handled it lost custom and the Dutch smuggling went on. In 1770 the other new duties were repealed but that on tea remained. In 1773 the East India Company, with 17,000,000 pounds of unsalable tea stored in London warehouses because of this non-importation and in imminent danger of a failure most disastrous to English financial and political interests, asked Parliament for a colonial drawback of the entire shilling, to undersell the Dutch. This was granted 10 May; tea ships were sent to Boston, New York, Philadelphia and Charleston and consignees or "tea commissioners" appointed in each place. But the colonies were now resolved that no taxes, external or internal, should be paid except under their own control, and set themselves to prevent the collection of the duty. In the cities other than Boston this was done by forcing the consignees to resign and in New York and Philadelphia the ships were sent back without unloading. In Charleston the duty was left unpaid for 20 days, when by law the customs officers seized it and offered it for sale to pay the charges, but as no one dared buy it, it spoiled unused. In Boston the tax was defeated by the refusal of the consignees — two sons of Governor Hutchinson and three loyalist friends of his — to resign. On Sunday, 28 November, the *Dartmouth,* under Captain Hall and owned by the Quaker, Francis Rotch, arrived with 114 chests of tea and was moored at Griffin's wharf. The Committee of Correspondence, which really governed the province, induced Rotch to defer its entry until Tuesday and on Monday morning called a great mass meeting at the Old South Church, which resolved that Rotch would enter the tea at his peril. The captain was cautioned to let none be landed and a watch of 25 men was stationed at the wharf. The consignees, asked to send the tea back, replied that it was not in their power but they would store it till they could hear from their constituents. Tuesday afternoon, however, Rotch and Hall agreed to return it without its touching land or paying duty, and the owners of two other ships which arrived shortly after, the *Eleanor* and *Beaver,* made the same promise. These ships were moored at the same wharf, so that one guard might serve for all. But by law the ships could not be cleared till the cargo was discharged, and Hutchinson refused to give the owners permits to pass the Castle, had the guns loaded and Admiral Montagu guarded the mouth of the harbor with two war-ships, though curiously neither of them put a guard on the tea ships. At midnight on the 16th, the *Dartmouth's* 20 days would expire and the American victory be practically won by the seizure of the tea for unpaid duty, since none of it would come on the market. But the object of the Boston leaders was not merely to prevent the English exchequer profiting but to commit the colony to open disobedience of English orders and have some issue to unite upon with the other colonies. On the 14th Rotch was again ordered by a meeting at the Old South to apply for a clearance, and several leading patriots escorted him to the custom-house to see that he did so. The collector refused to give an answer till the next day, when, upon a final visit from Rotch and his volunteer bodyguard, he definitely refused unless the teas were discharged. At 10 the next morning Rotch appeared before another huge meeting at the Old South and reported the refusal. He was directed to protest against it at once and apply to Governor Hutchinson for a permit to pass the Castle. Hutchinson was at his house on Milton Hill, some eight miles out, and it was 6 P.M. before Rotch returned with the news that the governor also refused. Meantime some 7,000 people had gathered in and about the Old South, probably half of them from neighboring towns; addresses were made by Samuel Adams, Josiah Quincy and several other leaders, and it was unanimously resolved that the tea should not be permitted to land. Hutchinson's refusal had been discounted, and 40 or 50 men, disguised as Indians, with paint and gear, had gathered in the back room of a printing office nearby, waiting for an agreed signal, and the meeting continued in session till long after dark, awaiting Rotch's report. On receiving it Samuel Adams gave the appointed signal, "This meeting can do nothing more to save the country," and a shout from the porch was answered by a war-hoop from the "Mohawks," who at once rushed to the wharf followed by a thousand or so of others and with perhaps a hundred of them boarded the ships, and for three hours worked steadily with hatchets, breaking open the chests and throwing the tea into the harbor. The entire 342 chests on the three ships, valued at about £18,000, were destroyed, without a sound from the mob, which then dispersed. Meantime a fourth tea ship was wrecked off Cape Cod. The immediate result of this was the Boston Port Bill (q.v.); but, as the Bostonians had expected, the whole country rallied to their support.

BOSTON TEN TOWNS. See BOUNDARIES OF THE UNITED STATES.

BOSTON TERRIER, a breed of dogs, resembling bull-dogs without their eccentricities, which originated in Boston about 1870, and soon became popular for its admirable qualities as a companion. This terrier has a shapely bull-dog-like head, and the straight legs and active manners of the old bull-terrier. Those truly bred always have a white muzzle, a white blaze on the face and on the chest and feet, with a fine coat, short and bright, and a deep broad chest. Light-class ones weigh from 15 to 23 pounds, and the heavy from 23 to 30 pounds. The breed arose from a cross between Robert C. Hooper's "Judge" (a dog three-quarters English bull and one-quarter white terrier, which was a rich dark brindle with a white flare on his face), and Burnett's "Gyp," a pure white bitch low on the legs and stockily built, not unlike the old-fashioned bull-terrier. The product was Wells' "Eph." He was born in Boston about 1870 and was bred to Tobin's "Kate," an old-fashioned bull-terrier, and the result, Barnard's "Tom," may be said to be the first of the real new breed, for he developed the typical screw tail of the present Boston terrier. This dog has a most affectionate disposition, is well knit in build and is stylish.

BOSTON UNIVERSITY. This institution was chartered by the Commonwealth of Massachusetts in 1869. The three men named in the charter as the original corporators were Isaac Rich, Lee Claflin and Jacob Sleeper. The power to hold and administer funds, establish departments of instruction, appoint officers, and, in general, to direct the administration, vests in the corporation, whose legal title is «The Trustees of Boston University.» The body consists of the president of the University, ex officio, and five classes of trustees elected from year to year for the term of five years. The president of the University and the deans of the several departments constitute the University Council. To it belongs, among other duties, that of securing a harmonious adjustment of all interdepartmental questions of administration. The members of the University Council, together with all the regular professors in the different schools and the College of Liberal Arts, constitute the University Senate. All promotions to degrees are in the name of this body and of the corporation. This body consists of all persons who have acquired any degree or diploma of graduation in the University. Every promotion to a degree, or to the status of a graduate, is accordingly, promotion to membership in the Convocation, with defined privileges of representation in the government of the University, and with corresponding duties. Boston University consists of the following departments: a College of Liberal Arts (organized 1873); a College of Business Administration (organized 1913); a School of Theology (organized 1839, made a department of Boston University in 1871); a School of Law (organized 1872); a School of Medicine (organized 1873), and a Graduate School (organized 1874). The faculty numbers 294. The enrolment for the scholastic year 1920–21 was 6,665. The University is co-educational throughout. Boston University confers the usual academic and professional degrees for resident study, but has never conferred any honorary degrees. Since its organization Boston University has had three presidents: William Fairfield Warren (1873–1903), William Edwards Huntington (1903–1911), Lemuel Herbert Murlin (1911).

BOSTONIANS, The, a novel of American life, by Henry James, published in 1886. Written in a satirical vein, it presents with unpleasant fidelity a strong-minded Boston woman possessed by a «mission,» «who takes life hard,» is never so happy as when struggling, striving, suffering in a cause which throughout the novel is the emancipation of women.

BOSTRÖM, bôs'trem, **Christoffer Jacob,** Swedish philosopher: b. Pitea 1797; d. Upsala 1866. His life was practically spent in teaching at the University of Upsala where, after preparatory study, he received the appointment in 1838 of adjunct professor of philosophy and from 1840–63 was professor of practical philosophy. His writings, comparatively few in number, edited by Edfelt, were published (Upsala 1883). «The most important systematic thinker of his country,» according to Falckenberg, his philosophy that of «rational idealism» as he termed it has exercised great influence in Sweden. Reality is presented only as spiritual: God as an absolute, self-conscious unity, in which all living beings are eternally and unchangeably contained, according to degree. The highest aim of humanity should be the conduct and behavior according to reason in harmony with the Divine; that of the state, like the individual should exist solely in God, and in its most perfect form should consist in the harmonious obedience of all its members to a constitutional monarch; while ultimate perfection should be an all-embracing system of such states governed in obedience to Universal Reason.

BOSTWICK, Arthur Elmore, American librarian and author: b. Litchfield, Conn., 8 March 1860. A student of Yale University, he received his Ph.D. degree in 1883, and taught for a short time, before engaging in literary work on Appleton's ‹Cyclopedia of American Biography,› Appleton's ‹Annual Cyclopedia,› Funk & Wagnall's ‹Standard Dictionary› and, with J. D. Champlin, edited a popular ‹Young Folks' Cyclopedia of Games and Sports› (1890). He received the appointments of chief librarian New York Free Circulating Library in 1895; of the Brooklyn Public Library in 1899; of the circulation department of the reorganized New York Public Library in 1901; and of the Saint Louis Public Library in 1909 when he also became president of the American Library Institute. He is the author of ‹The American Public Library› (1910); ‹The Different West, as seen by a Transplanted Easterner› (1913); ‹Earmarks of Literature› (1914); ‹The Making of an American Library› (1915).

BOSWELL, James, English writer, the biographer of Samuel Johnson: b. Edinburgh, 29 Oct. 1740; d. London, 19 May 1795. He was the son of a Scotch judge, Lord Auchinleck, who took this title from the name of his estate. He was educated at Edinburgh and at Glasgow, and early displayed literary tastes. In 1763, when on a visit to London, he was introduced to Johnson, and though this first meeting was not very hopeful for the future, a warm friendship soon sprung up between them. During a year spent on the Continent, he made the acquaintance of Voltaire, Rousseau and other prominent men of the day. Returning in 1766 he was admitted an advocate, but the practice of his profession was little to his taste. In 1768 he published a history of Corsica, with a lively account of his own experiences in the island. The same year he again met Johnson in London, and his intercourse with him was kept up by many subsequent visits to the metropolis; while Johnson himself came to Scotland in 1773, when the pair made their famous journey to the Hebrides. This year also Boswell became a member of the famous Literary Club, with various members of which, such as Burke and Reynolds, he was on terms of intimacy. In 1769 he had married, but he continued mainly dependent on his father till the latter's death in 1782, when he succeeded to the estate. In

1784 he met Johnson for the last time at a dinner at Sir Joshua Reynolds'. Two years after (1786) came out his 'Journal of a Tour to the Hebrides with Samuel Johnson, LL.D.' (Johnson's own account of the tour had appeared in 1775). Having latterly been admitted to the English bar, he went on circuit and held for a year or two the recordership of Carlisle; and from 1788 onward he mostly resided in London. In 1791 appeared his 'Life of Johnson,' a work which he had been long preparing, and which at once gave readers the same delight as it has ever since inspired. A second and enlarged edition came out in 1793. By this time Boswell's health had greatly suffered from his too convivial habits, and he died in London, having been a widower since 1790.

Boswell was a singular compound of sense and folly, of genuine ability and foible bordering on craziness. His good nature was universally admitted; his vanity and want of self-respect and self-control were his most evident faults. His weaknesses were easily seen, but the man who enjoyed the sincere affection of Dr. Johnson and the enduring friendship of Burke and Reynolds had better stuff in him than appeared to the superficial observer. His life of Johnson is such a masterly performance as only a genius for life-portraiture could have produced. Among editions of the Life may be mentioned that of Croker (10 vols.) and those of Rev. A. Napier (Bohn's Standard Library, 6 vols.), and Dr. Birkbeck Hill (Clarendon Press, 6 vols.), all containing the Tour. See JOHNSON, BOSWELL'S LIFE OF. Consult Macaulay's essay, and the much more humane and penetrating essay by Carlyle. Consult also his 'Life' by Fitzgerald (London 1891); Rogers, 'Boswelliana' (ib. 1874); Bissell, 'Boswell as a Biographer' (New York 1905). Boswell left two sons. The elder, ALEXANDER, born in 1775, succeeded to the family estate, sat for a year or two in Parliament and was created a baronet in 1821. He wrote several well-known Scottish songs and various other things in verse and prose, and also set up a private press from which issued reprints of rare old works in the Auchinleck library. In 1822 he met his death in a duel with a Mr. Stuart, against whom he had made some severe attacks in a political journal. JAMES, the second son, born in 1779, died in 1822, was the editor of an improved edition of Malone's Shakespeare, generally known as the 'Variorum Shakespeare' (21 vols., 1821).

BOSWELL'S LIFE OF JOHNSON. See JOHNSON, BOSWELL'S LIFE OF.

BOSWORTH, Francke Huntington, American physician: b. Marietta, Ohio, 25 Jan. 1843. He was educated at Yale and at Bellevue Hospital Medical College, and in 1898 became professor of diseases of the throat at the latter institution. He became consulting physician to the Presbyterian and Saint Vincent's hospitals, New York. He is an authority on diseases of the nose and throat. He retired in 1906. His publications include a 'Treatise on Diseases of the Nose and Throat' (2 vols., 1893); 'Text-Book of Diseases of the Nose and Throat' (1896); 'The Doctor in Old New York' (1898); 'A Study of Nasal Catarrh' (1882); 'Growths in the Nasal Passages'; 'The Three Tonsils'; 'Malignant Disease of the Upper Air Tract'; 'Taking Cold.'

BOSWORTH, Joseph, English philologist: b. Derbyshire 1789; d. 27 May 1876. He was educated at Repton, Aberdeen and Trinity College, and was ordained deacon in 1814 and, after occupying several livings in England, was British chaplain at Amsterdam and Rotterdam from 1829–40, and translated the Book of Common Prayer into Dutch. He devoted much time to researches in Anglo-Saxon and its cognate dialects, the result of his studies appearing from time to time. His chief works are his 'Anglo-Saxon Grammar' (1826); 'Dictionary of the Anglo-Saxon Language' (1838), and 'Compendious Anglo-Saxon and English Dictionary' (1848). In 1857 he was presented to the rectory of Water Shelford, Buckingham, and next year was appointed Rawlinson professor of Anglo-Saxon at Oxford, a post which he held till his death. In 1867 he gave $50,000 to establish a professorship of Anglo-Saxon at Cambridge. He left a certain amount of materials that he had accumulated for a new edition of his larger Anglo-Saxon dictionary, and these were utilized and added to by Professor Toller of Manchester in the 'Dictionary' which has been published under his editorship by the Clarendon Press.

BOSWORTH, or MARKET-BOSWORTH, England, a small town in the county of Leicester, 12 miles west by south of Leicester; two miles south of it is Bosworth Field, where was fought, in 1485, the memorable battle between Richard III and the Earl of Richmond, afterward Henry VII. This battle, in which Richard lost his life, put a period to the long and bloody Wars of the Roses between the houses of York and Lancaster. Market-Bosworth has a grammar-school, dating from 1593, in which Dr. Samuel Johnson was at one time usher. Pop. 729.

BOT-FLY, name common to several dipterous insects of the family *Oestridæ* which are parasitic in their early stages upon or within certain domestic or wild animals. The body is stout, hairy, like the humblebees, and they are easily recognized by having the opening of the mouth very small, with rudimental oral organs. The middle part of the face is exceedingly narrow and the minute antennæ are inserted in rounded pits. The eggs hatch very soon after laying, and Riley thought, from the testimony of three independent witnesses, that the sheep bot-fly is viviparous, the larvæ hatching within the body of the parent, who deposits in the nostrils of the sheep the perfectly formed and living grub.

The larvæ are, in general, thick, fleshy, footless grubs, consisting of 11 segments, exclusive of the head, which are spined and tuberculated, the former in rows, which enable them to move about readily when living under the skin or in the frontal sinus and thus greatly irritate the animals on which they live. The stigmata are placed in a scaly plate on the thickened posterior end of the body. The mouth of the cutaneous larvæ consists simply of fleshy tubercles, while in those species that live in the stomach and frontal sinuses of their hosts, it is provided with horny hooks. While in this state they moult twice and then attain their full size. They feed on the purulent matter originating from the irritation produced by the movements of their bodies. Just before assuming the pupa state, the larva leaves its peculiar habitat, descends into the ground and there becomes a coarctate pupa. (See PUPA).

Besides the horse bot-fly (q.v.), the ox bot-fly (q.v.) and the sheep bot-fly (q.v.), there is included in the genus *Dermatobia* the «ver macaque» of Cayenne and Mexico, which is found beneath the skin of man in tropical America. It is disputed whether it be a true indigenous «*Œstrus hominis*» or one that originally attacked the monkey, dog or other mammal. In Cayenne the species attacking man is called the «ver macaque,» in eastern Brazil (Pará) «ura,» in Costa Rica «torcel,» in Colombia «gusano peludo» or «muche.» The «ver moyocuil» (*D. noxialis*) lives on the dog, sheep, cattle and man, and is found in Mexico and New Granada. The larvæ are long, cylindrical, S-shaped, differing greatly in form from others of this family. The flies are closely allied to those of the preceding genus.

Leidy states that several specimens of the larva of a bot-fly were obtained in Honduras (by Le Conte). They were usually found beneath the skin of various parts of the body and the eggs were suspected to have been introduced while the persons were bathing. The men were not aware of the circumstance, and the presence of the larva gave them comparatively little uneasiness. According to Krefft, a species of *Batrachomyia* is parasitic upon four species of Australian frogs. The larvæ are found between the skin and the flesh behind the tympanum. When they quit the frog the latter dies. The change to the pupa state is usually effected on the lower surface of a piece of rock in some damp locality. The perfect insect emerges in 32 days. Consult Packard, 'Guide to Study of Insects' (1889); Brauer, 'Monographie der Oestriden' (Vienna 1863); Osborn, 'Insects Affecting Domestic Animals' (Bulletin No. 5, N. S. Division of Entomology, United States Department of Agriculture, Washington 1896, which also contains an extensive bibliography of the *Oestridæ*.)

BOTANICAL GARDENS. The term botanical garden is used to designate a limited area of ground on which is grown a collection of plants including a large number of species brought together to subserve scientific, educational, æsthetic or economic purposes. In the broadest sense, it is a museum of plants and one of its chief ends is to represent, by means of living specimens so far as possible, the principal types of vegetation of the earth. It is impossible to cultivate more than a few thousand species on any given area under the natural conditions of soil and climate, and the open-air plantations are generally supplemented by collections grown under shelter, in glass houses and in specially prepared soils. It has been found practicable to grow in this manner as many as 12,000 or 15,000 species of the higher plants in the botanical gardens at Saint Louis and New York, at Kew, near London, England, and at Berlin, Germany. A proper selection of this number may be made to represent somewhat fairly the principal forms of plants, which include about 250,000 species. That is to say, it is possible to grow in one place about one species out of every 17 in existence.

Living plants cultivated in the open air are most suitably arranged in plantations according to their general habit and in such manner as to show their general relationships. Then special groups are often made of certain families, such as the conifers, the willows and poplars, the grasses, ferns or mosses. The most common arrangement of plantations includes the herbaceous grounds, the aquatic plants, alpinum, viticetum, fruticetum, arboretum and economic plantations. Some institutions bring together collections for the purpose of illustrating the local flora or the flora of any given geographical district.

The herbaceous plantations are intended to include the representatives of small soft-bodied plants which die down to the soil during the winter or resting season, and which may or may not have a perennial underground stem-formation of some kind. Many of the species are annuals and must be grown from seeds every year.

The pools for aquatic plants are arranged to afford suitable means for the culture of forms which float or root in ponds and streams of fresh water, and include a wide variety, such as the water-lily, pondweeds, *Philotria*, water-hyacinth, etc.

An alpinum is a special plantation generally arranged to afford means of cultivation of species from cold climates on mountain-tops or in higher latitudes. Plantations of this kind are often termed rockeries, and are in the form of a ridge or hill covered with boulders. In such plantations precautions must be taken to give lime-loving plants a place among limestone rocks, and with the necessary low temperatures.

The viticetum is a plantation devoted to the cultivation of climbing and trailing vines, and may take almost any form demanded by the exigencies of practical gardening. Among the necessary features are trellises or supports for twining and tendril climbing forms.

The fruticetum includes all woody perennial plants which do not form a central trunk six feet in height, and which are therefore not trees. These are most effectively grouped when the individuals of the separate species are placed in the ground separately in a scheme of general arrangement by which every plant may be inspected from all sides and is unshaded by its neighbors.

The arboretum includes trees, and these may be variously arranged, singly or in groups, always with respect to their mutual relationship. On account of their great size and comparatively slow growth and greater permanency, the placing of trees in any given landscape scheme in a garden is attended to with the greatest care.

The economic plantations may include useful plants arranged according to their relationships, and grouped according to the use or nature of the derivative. Thus a division may be made in which only species used for medicine, foods or clothing are included, or a division may be made to include plants which yield starches, oils, gums and resins.

Special plantations of selected families must depend for their constituency upon the location of the garden. Thus it would be possible to form a collection of palms in a tropical garden and one of pines or willows in a temperate climate. Geographical plantations may take any given district by variously arranged plantations.

Still another group of plantations is being made in some gardens to illustrate types of habit and structure. Some of the principal groups to be illustrated in this manner are parasites, which draw nourishment from the living bodies of other organs; saprophytes, which live on decaying organic matter; xerophytes, plants adapted to living under the driest conditions; plants with structures serving as a protection against animals. Forms of propagation and reproduction, methods of dissemination of spores and seeds, etc., also serve as subjects to be illustrated by separate groups.

The collections grown under shelter and in conservatories are generally grouped in such manner that species are partly assembled with regard to their climatic requirements, and partly according to their relationships. Thus a house may be devoted to tropical plants, or to temperate plants, or may contain only orchids, palms, ferns, cacti or succulents, or other special groups.

The part of the vegetable kingdom which may not be cultivated may be represented in a museum by dried specimens, material in preserving-fluids and dissections of various kinds. Here again the arrangement may be upon the basis of natural relationship, or upon the basis of economic usefulness. The species which formed the vegetation of the previous geological periods are represented by fossil specimens, completing the history of the plant-world so far as it is known, and yielding suggestions as to the descent of the present types.

Two general educational purposes are served by an institution of this character. Its collections are arranged to present information on the form, relationship, mode of life, habit and general biological character of the principal types of vegetation, in such manner as to be capable of comprehension by persons unacquainted with the technical aspects of the subject. Further interpretation of such facts may be made by means of books, journals, lectures, etc., devoted to this branch of work and study.

The material accumulated for the exploitation of popular knowledge of plants also affords an excellent basis for the induction of students into the more strictly scientific aspects of botany; and when such material is supplemented by laboratories furnished with apparatus, microscopes and other instruments of precision, the activities of these students may be carried beyond the frontiers of the subject into the investigation and discovery of new facts and phenomena. This extension of the boundaries of knowledge concerning the plant-world may be carried on to advantage only when a library is at hand containing all of the more important literature bearing upon the subject.

Botanical gardens owe their origin to the needs of medical science, in accordance with which species showing valuable medicinal properties were grown in convenient places.

The first authentic record of the introduction of medicinal plants into cultivated plots of ground dates no farther back than the time of the elder Pliny (23–79 A.D.), who writes of the garden Antonius Castor, at Rome, in which were grown a large number of medicinal plants. This step, however, may have been taken much earlier by the Greeks, Chinese or Mexicans. Later the Benedictine monks of northern Italy paid great attention to the growing of remedial herbs, and devoted an important proportion of the monastery gardens to this purpose. This practice was also carried beyond the Alps, and in 1020 a garden was in existence at the monastery of Saint Gall, in Switzerland, not far from Lake Constance, which contained 16 plots occupied by medicinal plants. A garden of this character was founded 1309 at Salerno, and another at Venice 1330.

The 16th and 17th centuries witnessed the foundation of many gardens in England, France, Germany, Holland and Sweden, some of which have had a continuous existence to this day. The garden of Bologna was founded 1568; Leyden, 1577; Leipzig, 1579; Montpellier, 1596; Paris, 1597. The last named was organized for the determination of «what variations were possible in the style of bouquets worn at the royal courts.» Then followed the establishment of the gardens at Giessen, 1605; Strasburg, 1620; Jena, 1629; Oxford, 1632; Upsala, 1667; Chelsea, 1680.

The number of these institutions at the present time is nearly 300, only a few of which, however, are devoted to the more important purposes named above. Many botanical gardens are merely municipal parks in which some attempt is made to exhibit special groups of plants, and are devoted chiefly to floriculture. Others are almost entirely experiment stations for the exhibition and testing of economic species, while still others find their chief usefulness as an aid in teaching botany in schools and colleges. For the educational value of botanical gardens, consult Monroe, ‘Cyclopedia of Education.’

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BOTANICAL GEOGRAPHY. See Plant Geography.

BOTANICAL SOCIETY OF AMERICA, established 1893, an outgrowth of the Botanical Club of the American Association for the Advancement of Science, a national scientific association including many of the best known botanists and scientists of the United States.

BOTANY. That branch of biology, or the science of living organisms, which deals with plants, and is thus distinguished from zoology, which deals with animals. An individual plant, considered as a living or once living organism, may be studied in two ways — with reference to its structure or with reference to its functions. These represent the two great subdivisions of pure botanical science—anatomy and physiology respectively. All other phases of botanical science are special developments of one of these two, either alone or in combination with the other, or in relation additionally to some other branch of knowledge. Anatomy and physiology are thus the primary elements, as it were, of botany, which in varying combinations with each other and with the elements of other sciences constitute the branches of botanical science actually in existence, such as taxonomy, ecology, cytology and pathology. The term plant anatomy is restricted frequently in actual use to gross anatomy and is often called structural botany. In this sense is covered about as much of the whole of anatomy as can be studied by the unaided eye or with a lens. Minute anatomy, or histology, covers the minute structure of plants, the principal instrument in its study being the compound microscope. A study of the relationships of plants on the basis of anatomical resemblances constitutes comparative anatomy, or morphology. The classification of plants, known as taxonomy or systematic botany, is in the main a specialized branch of morphology, for the principal means by which plants may be grouped so as to indicate their genetic relationship is a comparison of their structural differences and resemblances. In its actual study plant physiology is closely associated with plant histology because most of the functions of the plant are intimately connected with the structure of plant cells, and the physiologist must of necessity understand these structures. A special branch of botanical research which has to do with the complex structure and activities of the plant cell is known as plant cytology. The study of the diseases of plants, whether they are due to fungi or other plant organisms, or are purely physiological, is plant pathology, sometimes called vegetable pathology.

History.— Among the ancients, Aristotle, the Greek philosopher (384 to 322 B.C.), Theophrastus, his pupil (about 372 to 287 B.C.), the Roman naturalist, Pliny the Elder (23 to 79 A.D.), and the Greek physician, Dioscorides (of the 1st or 2d century A.D.), left botanical records of historical interest, but botany as a modern science has developed in the last four centuries, dating from the Reformation. The writing, particularly by the Germans, of herbals, or treatises on economic and medicinal plants, and the founding of botanical gardens, occupied most of the 16th century, but in the year 1583 Cesalpino, an Italian physician, published the first formal and comprehensive classification of plants. This, though artificial, formed the basis of all generally recognized classification to and including the time of Linnæus in the latter part of the 18th century. The 17th century was chiefly notable for advances not in the classification of plants, but in their structure and vital processes. Malpighi, an Italian, and Grew, an Englishman, almost simultaneously published their researches on the gross anatomy and the cellular structure of plants, the first of which were presented in 1671. To the work of these men in plant anatomy little of importance was added in more than a hundred years. The other important discovery of the century was the demonstration by Camerarius in 1691, through direct experiment, of the sexuality of plants. The 18th century was marked especially by advances in classification. In the year 1700 Tournefort published his ‹Institutiones,› in which for the first time genera were systematically named and described. During this century Linnæus, the great botanical compiler and systematizer, brought out his successive works, culminating in the ‹Species Plantarum,› in 1753. It was later in the same century, too, that botanical exploration came to be recognized as an important department of the voyages of geographic and scientific discovery in which the nations of Europe became engaged. In 1789 A. L. de Jussieu published his ‹Genera Plantarum,› in which was first systematically formulated a comprehensive classification of plants according to their natural relationship, as opposed to the artificial systems followed by Cesalpino and Linnæus. In the last two decades of this century were laid the foundations of our present knowledge of the important part played by the air in the nutrition of plants, a proper conception of which was possible only in the light of the new developments which took place at that time in chemistry. The 19th century witnessed enormous strides in plant anatomy and plant physiology, the latter largely contributed to by workers in chemistry and physics, and the former rendered possible by improvements of the compound microscope and accessory instruments, especially those which came into general use about 1840. From this movement has been derived most of our knowledge of the life-history and relationship of the lower groups of plants, the fungi, algæ and lichens, and the assignment of the pines and their relatives to their true position next above the ferns. The whole realm of botanical research was profoundly affected by the work of Darwin, beginning with the publication of his ‹Descent of Man,› in 1858, which gave a new point of view for all subsequent work. In systematic botany the principle of the development of species from a common ancestor was substituted for the old view of the constancy of species. The remarkable adaptations for cross fertilization in the coloration, odor and structure of flowers was given its true and significant explanation as a means for originating and perpetuating species. Darwin's work gave a new philosophical basis for the interpretation of observed phenomena and facts.

Progress in the United States.— At the beginning of the 19th century the advancement of botany in North America was largely in the hands of physicians, through their requirement of a knowledge of plants as materia medica. Professors of botany were unknown. Linnæus and other great botanists in Europe had had American correspondents, and geographic expeditions accompanied by European botanical collectors had touched the margins of the continent. Some botanical explorations, chiefly by European visitors, had been effected east of the Alleghany Mountains. The centre of botanical activity was at Philadelphia, among the members of the American Philosophical Society. With Lewis and Clark's expedition across the continent to the mouth of the Columbia, in 1803–06, began a series of American explorations of the great interior, directed first to the Louisiana Purchase, then to Oregon and finally to California. These were supplemented on the north by the British expeditions of Sir John Franklin and others in quest of a Northwest Passage. In the fifties began the Pacific Railroad surveys and these were followed by the geological surveys. All these contributed materials for the discovery, description and orderly arrangement of the North American flora, the collections going largely into the hands of Thomas Nuttall at Harvard University, John Torrey at Columbia, Asa Gray, who was Nuttall's successor, and George Engelmann, a physician of Saint Louis. Meanwhile appeared a new factor which was destined to play an important part in the development of botanical science in America, the establishment of agricultural colleges in the late sixties. These institutions created a demand for a class of botanists who did not exist in the United States or anywhere else, botanists who had brought a critical scientific training to bear on the hard problems of agriculture. For the succeeding two decades the universities of the country, including some of the agricultural colleges themselves, were busily engaged in educating the required men, a movement which resulted in the preparation of many who were competent not only to act as teachers of botany in the agricultural colleges but, a still more important matter, to act as investigators in agricultural experiment stations, one of which was established in each of the States and Territories in the late eighties. The branch of botany which received its greatest impulse was pathology, the science of the diseases of plants. Plant pathology has already been carried to a point of high scientific development and practical application attained in no other country. Systematic, or, as it is now more commonly known, taxonomic, botany has made rapid strides forward in the past two decades, largely through the application of methods developed and perfected by American botanists. These methods differ from others chiefly in a full consideration of the geographic relationships of plants and the examination of very large series of specimens. A revision of the whole North American flora along these lines and accompanied by systematic botanical exploration is now under way. For the future two lines of inquiry are likely to be conspicuous in American botany, first, the principles of heredity in plants and the applied phase of the subject, plant breeding on a scientific basis; and second the correlation of plant functions with plant structures, a work which will have far-reaching importance in broadening our understanding of the processes of nature. Forestry has assumed an unrivaled importance with the exploration of Alaska, the botany of the semi-arid region is being studied, and bacterial botany occupies some of our best minds. The geographic location of American botanical research has undergone a profound change as a result of the Spanish-American War. The area to which up to that time the energies of American botanists had been chiefly directed was the north temperate belt of one hemisphere, but they now must deal in addition with botanical problems in the tropics of both the New World and the Old World.

Classification.— The plant kingdom is divisible into five great groups, the *Myxophyta,* or slime molds; the *Thallophyta,* including the bacteria, algæ, fungi and lichens; the *Bryophyta,* including the liverworts and mosses; the *Pteridophyta,* including the ferns and their allies, and the *Spermatophyta,* or flowering plants. The first four of these are often jointly designated as the *Cryptogamæ,* or cryptogams, in contradistinction to the *Phanerogamæ,* an older name for the flowering plants.

The *Myxophyta,* or slime molds, known also as the *Myxomycetes, Mycetozoa* and *Myxothallophyta,* are organisms which though usually treated as belonging to the vegetable rather than the animal kingdom, have no cellulose walls covering the cells of which they are composed; pass a part of their life as plasmodia, or masses of naked creeping protoplasm similar to the animals known as amœbæ; and are reproduced without even the simplest method of sexual regeneration. Most of them resemble fungi in that they grow upon decayed animal or vegetable matter. The *Thallophyta* include a wide variety of plants, associated with each other by exclusion, on the one hand, from the animal-like *Myxophyta,* and, on the other, from the *Bryophyta* and higher plants. The plant body is commonly not differentiated into stem and leaf and may even be unicellular; a cell wall is usually present; chlorophyll is often wanting and frequently sexual reproduction does not exist. Among the important groups belonging to the *Thallophyta* are the *Schizomycetes,* or bacteria; the *Schizophyceæ,* or blue-green algæ; the *Euphyceæ,* or true algæ, including the diatoms, desmids, green algæ, stoneworts, brown algæ and red algæ; the *Eumycetes,* or true fungi, and the *Lichenes,* or lichens. The *Bryophyta,* or liverworts and mosses, are small plants, having in their life cycle a sexual generation in which the sexual organs are borne on a plant body usually differentiated into stem and leaves, followed by a non-sexual generation, which consists of a stalked or sometimes sessile spore-bearing capsule remaining attached to the plant body of the preceding generation. The female organ of reproduction consists of an oosphere in a sac called an archegonium, the walls of which are made up of many cells, much more complex structurally than the female organ of the *Thallophyta.* The male organ consists of motile antherozoids produced from an antheridium. The group consists of the *Hepaticæ,* or liverworts, some of which have a flat scale-like body called a thallus, and of the *Musci,* or mosses. The *Pteridophyta,* represented by the ferns, resemble the *Bryophyta* in their sexual organs, but differ in the possession of what is known as vascular, as opposed to merely cellular, tissues, and also in that the asexual generation becomes a large plant and maintains a separate existence independent of the earlier generation. The group includes, besides the true ferns, the grapeferns, jointrushes, clubmosses, quillworts and a few others. The *Spermatophyta,* or flowering plants, also known as *Anthophyta* or *Phanerogamæ,* find their essential difference from the *Pteridophyta,* not in the production of flowers, but in the relationship of the sexual and the asexual generations and in the character of the sexual organs and their embryonic product. In an ordinary fern the sexual generation is a small flat green organism, resembling a thallose liverwort, growing on the ground or other substratum and deriving its nourishment from it, but in the *Spermatophyta* the sexual generation is reduced to almost microscopic dimensions, and leads to independent existence but is enclosed within the body of the non-sexual generation, the male portion consisting of the pollen grain and the tube that grows out of it when the pollen grain germinates, the female portion consisting of a minute cellular structure within the embryo sac of the ovule. It is to be noted that no motile bodies are produced, as in the two preceding groups, and that the fertilization of the ovule results in the development of an embryonic plant called a seed, which is produced by none of the lower groups of plants. The *Spermatophyta* are divided into two groups, of which the lower is the *Gymnospermæ,* including the cycads, the cone-bearing trees and a few related families. In these the ovules are borne not in ovaries but naked among the floral bracts, and the sexual generation of the female is still comparatively complex before fertilization and bears considerable resemblance to that of some *Pteridophyta.* In the other group, the *Angiospermæ,* the ovules are borne in ovaries, and only the simplest remnant of a sexual generation persists. In this group are the *Monocotyledones,* including the grasses, palms, lilies, orchids and their relatives, and the *Dicotyledones*, including the great majority of flowering plants. The dicotyledonous and the gymnospermous plants were at one time classed as a group *Exogenæ,* in contradistinction to the group *Endogenæ,* which consisted of the monocotyledonous plants. This grouping of the flowering plants into exogens and endogens, however, is no longer maintained, it having been shown from embryological studies that the gymnosperms should stand next above the ferns. The old division of dicotyledonous plants into *Apetalæ, Gamopetalæ* and *Polypetalæ* is also now discarded, the families included under *Apetalæ* appearing not to constitute a real group. They have therefore been interpolated among the families of the remaining two groups, most of them going with the *Polypetalæ.* All three of the old names have been abandoned, the name *Archichlamydeæ* being now used for the apetalous and polypetalous plants jointly, and the name *Sympetalæ* for the gamopetalous plants. The known species of plants as based on recent standard and conservative enumerations of the various large groups are approximately as follows:

Myxophyta	400
Thallophyta	59,000
Bryophyta	8,000
Pteridophyta	3,500
Spermatophyta	120,000
	190,900

Plants in Relation to Geology.— Plants play an important part in the configuration of the earth's surface by the prevention or retardation of erosion. This is accomplished by the direct binding action of roots on the soil, by obstructing the run-off of water as it filters through a layer of decaying vegetable matter and by hindering the melting of snow under the shade of a forest cover. Wind erosion of sand or dust soils both on beaches and in arid regions is prevented chiefly by vegetation. In the building up of peat deposits, such as the sphagnum bogs of the Northern States, or the Dismal Swamp, Okefinokee Swamp or the Everglades, plants are the principal factors. Deposits of coal and petroleum are of vegetable origin. The disintegration of rocks is hastened by the presence of living mosses and other plants. The fertility of soils is largely dependent on the admixture of decayed vegetable matter, or humus; and the so-called nitrifying organisms of the soil, which change nitrates, which cannot be taken up as food by plants, to nitrites, which are readily absorbed, belong to a group of microscopic plants known as bacteria. A very important rôle in soil fertilization is played by a certain group of plants, the *Leguminosæ,* including the clovers, beans and peas. One of the essentials of plant food is nitrogen. Ordinary plants have not the power to take free nitrogen from the air, where it exists in almost unlimited quantities, but absorb their nitrogen from certain nitrogenous substances in the soil. This element of soil fertility is soon exhausted. Leguminous plants, however, produce on their roots small tubercules containing bacteria which have the power to take free nitrogen from the air in the soil and put it into a form suitable for plant food. By the death and rotting of the plant the nitrogen thus absorbed from the air is incorporated in the soil and is available as food for all sorts of vegetation. In this way the leguminous plants are almost indispensable for the rehabilitation of soils worn out by excessive cropping.

Plants in Relation to Geography.— Most of the land surface of the earth is covered by a green mantle of vegetation, which varies in its makeup at different points in accordance with several factors, the most general of which in its variation is temperature. Certain areas of the north polar and south polar regions, permanently or almost permanently covered with snow or ice, and various similarly cold areas on mountains of higher and higher elevation in lower latitudes, are devoid of vegetation. Next to this is an area of sufficient warmth in summer to produce a vegetation of herbaceous plants and shrubs but devoid of trees — the Arctic, Antarctic and Alpine vegetation. Then come the temperate areas of the earth, characterized by a vegetative covering able to withstand freezing during a portion of the year, yet sufficiently warm to permit an abundant growth of trees. Next follows the tropical area, with a vegetation not subjected to frost and characterized especially by forests made up in part of palms. A factor of probably even greater importance, but more broken and restricted in its distribution, is moisture. The four great temperature categories outlined above are cross-hatched by moisture lines parallel with the lines of equal precipitation. With too little moisture forests cannot exist and we have plains and deserts of grass or brush. Neither do forests exist in a soil too persistently moist and poorly drained and thus we have moors, bog, natural meadows and savannas. The extreme of moisture is reached in the plants called aquatics, growing either in fresh water or in the ocean, often wholly submerged.

Each of the other factors in plant growth, light, air, food and the complex mechanical relations of the plant, varies greatly from one locality to another and in their various combinations with different degrees of heat and moisture they furnish an almost endless variety of environments. Each of these combinations of conditions has its characteristic association of plants, which, adapted to the conditions, and to each other, form a community. The study of plants in their detailed relation to these local surroundings forms a branch of geographic botany known as plant ecology. North America furnishes a good series of geographic areas with sufficient climatic differences to necessitate different floras. The vegetation of the continent is divided by Merriam into the following zones:

Arctic, Boreal, Transition, Upper Austral, Lower Austral, Tropical. The Arctic zone extends from northern Labrador northwestward across the northern edge of the continent to Bering Strait, dipping southward along the shores of Bering Sea to Bristol Bay, Alaska. The vegetation of this zone consists of herbaceous or of depressed woody plants, trees being absent. Over large areas, known as tundras, the ground is permanently frozen underneath, a few inches of the surface thawing each summer and permitting the growth, in a cold, wet soil, of an often luxuriant but low vegetation. The Arctic zone is represented southward as far as southern California and northern Arizona by certain Alpine plants on the summits of mountains high enough to have a timber line, approximately 12,000 feet in that latitude. The Boreal zone, sometimes subdivided into a northern, or Hudsonian, belt and a more southerly, or Canadian, belt, extends from the Arctic zone southward to a line traversing the northern part of New England, Ontario, Michigan and Minnesota, jumping to the higher elevations of the Adirondack and Appalachian Mountain systems, then continuing westward across North Dakota and Assiniboia to British Columbia, dipping south in the higher elevations of the Rocky Mountains nearly to Mexico, in the Cascades and Sierra Nevada to southern California and along the shores of the Pacific to northern California. The most characteristic feature of this zone is forests of spruce or balsam fir. The Transition zone covers most of New England, New York, Michigan, Minnesota, North Dakota, about half of South Dakota and the southern part of Assiniboia, thence extending southward through the Plateau and Great Basin to Arizona, New Mexico and California, in the southern parts of those States reaching down to an elevation of about 6,000 feet. The most characteristic tree of the eastern, humid part of this zone is the white pine; of the western, arid part, the yellow pine. The Upper Austral zone, as represented in the eastern United States by the so-called Carolinian flora, covers the lower Hudson Valley, southern New Jersey, Delaware, eastern Maryland, the Piedmont section of the South Atlantic States, middle Tennessee and Kentucky and most of Ohio, Indiana, Illinois, Iowa and Missouri, northwestern Arkansas, southeastern South Dakota and eastern Nebraska and Kansas. It is especially characterized by its forests of certain species of oak and hickory. The flora of the western part of this zone, known as the Upper Sonoran, covers the principal part of the arid western plains, from Washington and Montana southward through the Mexican plateau. The flora is devoid of trees and is commonly characterized by sagebrush or bunchgrass. The Lower Austral zone is divided, like the last, into an eastern humid and a western arid part. The eastern, containing the Austroriparian flora, covers the coastal plain from Chesapeake Bay to middle Texas, extending northward in the Mississippi Valley to extreme southern Illinois and Indiana. One of the most characteristic wild plants is the cane, while cotton is the most conspicuous cultivated plant. In the arid region of western Texas, the great valleys of New Mexico and the deserts of southwestern Arizona, southern Nevada and southeastern California, lies the western part of the Lower Austral zone, containing the flora known as the Lower Sonoran, characterized especially by the creosote bush and the mesquite. This flora has large extensions into northern Mexico. The Tropical zone covers the lower third of the Florida Peninsula, enters the extreme southern point of Texas and on the Pacific coast reaches north on the east side of the Gulf of California to the lower Colorado and Gila rivers. From these northern extremes the tropical flora extends southward through Mexico, Central America and the West Indies. Various genera and species of palms form the most conspicuous and characteristic features of this flora.

Plants in Their Economic Relation to Man.— Every savage race is intimately associated with the flora of its region. Having no means by which to supply the ordinary necessaries of life through foreign trade, as do many civilized races, the savage has learned from necessity to know the precise qualities of the plants about him as foods, textiles, poisons, dyes, tans, fuels, etc. In connection with the making of a single aboriginal instrument, such as a bow or a fire-drill and block, there is required on the part of the savage a knowledge of the strength, elasticity, texture and other qualities of all the kinds of wood occurring in the range of his travels, such as is not possessed by one person in a thousand among highly civilized races. The economic value of a correct and discriminating record of the uses of plants among aboriginal peoples is evident. The influence of a familiar flora in attracting a savage race to a wider geographic range or that of a strange flora in limiting migration in any direction is a natural outcome of the savage's exact knowledge of the plants of his native region. The practice of some of the migratory races of prehistoric man to transport their cultivated plants with them has resulted in the wide extension of these plants from the regions they naturally occupied. From this association it turns out that a critical study of the origin and distribution of the plants cultivated by aboriginal races throws important light on their prehistoric migrations. Some of these botanical facts appear to be of very great antiquity, perhaps even antedating those furnished by aboriginal arts or by language. This study of the relation of primitive man to his plant environment is called ethnobotany, or aboriginal botany. Some of the processes of plant life are important to man as being fundamental to his existence. The plant is an engine which through the energy furnished by sunlight is capable of transforming inorganic substances into organic compounds, without which animal life could not exist. The ordinary economic relations of plants to civilized man are many and enter as important factors into such arts and industries as agriculture, horticulture, medicine, manufacture and commerce. The production and elaboration of plant products and their transportation from those parts of the world in which they can be and are produced to other parts in which they are needed occupy probably the largest part of the energies of the human race. See ANATOMY OF PLANTS.

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BOTANY BAY, New South Wales, Australia, so called by Captain Cook on account of the many strange plants found growing there. Cook landed at Botany Bay on his first voyage in 1770, and took possession of the country in the name of his sovereign. The penal settlement, founded in 1788, and popularly known by the name of Botany Bay, was established on Port Jackson, where the city of Sydney now stands.

BOTANY BAY GUM, a gum resin produced by *Xanthorrhœa hastilis* of Australia.

BOTARGO, a relish made of the salted roe of the mullet or tunny, used on the Mediterranean coasts.

BOTETOURT, bôt-ẹ-toor, **Norborne Berkeley,** a conspicuous actor in American colonial history: b. England 1718; d. Williamsburg, Va., 15 Oct. 1770. He was the descendant of John Berkeley, the cavalier, who was ennobled by Charles II in 1660. He was sent to Virginia as royal governor in 1768, just eight years before the Declaration of Independence. He had full instructions from the Crown and directions to assume more dignity than had been the wont of colonial governors, and accordingly he paraded the streets of Williamsburg with guards, a coach and other requisites of vice-regal pomp. Conflicting duties to the King and the people made his situation most unpleasant. In 1769 the assembly took into consideration the incipient troubles with England, and on 16 May passed firm but respectful resolutions remonstrating against parliamentary taxation and the right claimed to send them to England for trial. So firm were they that Lord Botetourt summoned the speaker and burgesses before him and dissolved them. The result was that a convention met in a private house and took the incipient steps for the revolution. The convention did not attempt to legislate, but simply remonstrated with Parliament, sending its resolutions to the other colonies and to England. Under the influence of these resolutions Lord Hillsborough wrote a letter to Lord Botetourt, assuring him that it was not the intention of the government to tax the colonies, and that the obnoxious imposts would be withdrawn, which letter Lord Botetourt communicated to the assembly. All these anticipations, however, were destroyed by the policy of Lord North, who succeeded Charles Townsend, and the promise was not fulfilled in full, the duty on tea being retained. Botetourt was deeply mortified, and soon died of disease aggravated by mental suffering. He was deplored by men of all classes in the colony, and the legislature erected a marble statue to his memory, which is still standing in the College of William and Mary.

BOTH, John and **Andrew,** two Flemish painters, were born in Utrecht about the year 1610, Andrew being the elder. They were the sons of a glass painter, who instructed them in the rudiments of drawing. They afterward made further progress in the school of Abraham Bloemaart, and went at an early age together to France and Italy. John, attracted by the works of Claude Lorraine, chose him for his model; Andrew preferred the painting of the human figure, and imitated the style of Bamboccio. But although their inclinations led them in different directions, their fraternal affection often united their talents in the same works. Thus Andrew painted the figures in the landscapes of his brother; and their labors harmonized so well, that their pictures could not be suspected of coming from different hands. The ease and fine coloring in the beautiful figures of John cannot be overlooked in spite of the excess of yellow sometimes found in them. Andrew was drowned in Venice in 1650. John, inconsolable for his loss, abandoned Italy and returned to Utrecht, where he died shortly after.

BOTHA, bō'tä, **Christian,** Boer commander: b. the Transvaal; d. Kokstad, Griqualand West, 8 Oct. 1902. At the opening of the Boer War in 1899 he led a command into Natal and was active in the siege of Ladysmith and at the defense of the Tugela crossing. After the relief of Ladysmith he retreated to Laing's Neck, where he was left by his brother, Louis Botha, in command of the Boer forces. By opening negotiations with General Buller he delayed that general's advance for several days, and after the fall of Pretoria he was placed in command of all the Boer forces in the southeastern Transvaal. His frequent raids into Zululand effected the diversion that allowed Louis Botha and De Wet to continue the war.

BOTHA, Louis, Boer soldier and statesman: b. Greytown, Natal, 27 Sept. 1862; d. Pretoria, 28 Aug. 1919. He began life as a farmer, and as a young man had a share in the establishment of the Transvaal Republic. He was a member of the first Volksraad at Pretoria. Upon the outbreak of the Boer War with England in 1899 he was given a subordinate command, and upon the death of General Joubert in March 1900 he became commander-in-chief of the Boer forces. He won the victories of Spion Kop and Colenso, and after the fall of Pretoria organized the Boer forces to meet the campaign of attrition begun by the British. He was the chief representative in the peace negotiations in 1902, and on the cessation of hostilities visited Europe to raise funds to permit the Boers to resume work on their farms. In the grant of responsible government to the Transvaal he became (1907) Prime Minister of the colony, and in 1910 first Premier of the Union of South Africa. On the outbreak of the European War, a rebellion, instigated by Germany, broke out, which he promptly suppressed, and in 1915 he conducted a successful campaign against the Germans in Southwest Africa, receiving the surrender of that colony on 9 July. He worked steadily for race co-operation between Dutch and English, and but for him South Africa, during the course of the European War, might have ceased, at least temporarily, to be a British colony.

BOTHIE (Gael. *bothag,* a cot), a house, usually of one room, for the accommodation of a number of work people engaged in the same employment; especially, a house of this kind in parts of Scotland, in which a number of unmarried male or female farm servants or laborers are lodged in connection with a farm. Bothies are most common in the northeast of Scotland, and are chiefly for the accommodation of unmarried male farm servants engaged on the larger farms, who as a rule have to do their cooking and keep the bothie in order for themselves. The bothie system has often been condemned.

BOTHNIA, the name formerly given to a country of northern Europe, extending along the east and west shores of the Gulf of Bothnia, the east portion now being comprised in Finland and the west in Sweden.

BOTHNIA, Gulf of, the northern part of the Baltic Sea, which separates Sweden from Finland. It commences at the island of Aland, lat. 60° N., and extends to 66°; its length is about 450 miles, its breadth from 90 to 130, and its depth usually from 20 to 50 fathoms. As its water contains little salt, it freezes over in the winter, so as to be passed by sledges and carriages. It abounds in salmon and other fish and also in seals.

BOTHRIOCEPHALUS, a genus of cestoid worms which is found very abundantly in the intestines of predaceous fishes, and one species of which is sometimes found in the intestinal canal of man. It belongs to the same family as the tapeworm (*Tænia solium*), but it is distinguished from it by having its segments broader than they are long; by wanting the four discs which surround the head of the tapeworm, and having in their place two lateral longitudinal openings; and thirdly, by having the sexual organs on one of the flat surfaces of each segment instead of at the edges of the segments. The two longitudinal openings (whence the worm receives its name, from *bothrion,* a little pit, and *kephalē,* the head) do not seem to be organs of nutrition, but merely a kind of suckers by which the worm is enabled to attach itself to the intestines of the animal which it infests, while it is nourished by absorption throughout its whole length. Although, as already stated, this worm generally infests the bodies of predaceous fishes, it is capable of being transmitted to all vertebrate animals, and especially it is found in those birds which live upon fish. The only species which is found in the intestines of man is the *Bothriocephalus latus,* and it is rare to find even this species except among the inhabitants of two distinct parts of Europe, the north and the centre. It is found, on the one hand, in Russia, in Norway and in Sweden, and on the other hand, in Switzerland, the north of Italy, some provinces in Germany and some departments of France, but rarely elsewhere. It has been remarked that this worm is common where the Tænia or true tapeworm is rare, and vice-versa. It is rare in the United States, but with the increase of emigration from the regions of Europe where it abounds, its occurrence may be looked for.

BOTHWELL, James Hepburn, Earl of, is known in Scottish history by his marriage to Queen Mary. He was the only son of the 3d earl: b. about 1536; d. 1578. He succeeded his father in 1556, thus obtaining important offices and estates, and by 1566 he had attained to high favor with the Queen. The plot by which Darnley lost his life in 1567 was of his contrivance, and the Queen was suspected of conniving at it. Bothwell was charged with the crime and underwent a mock trial, being of course acquitted. After the death of Darnley he seized the Queen near Edinburgh, and carrying her a prisoner to Dunbar Castle, prevailed upon her to marry him. Before this he had divorced his own wife, Jean Gordon, sister of the Earl of Huntley. Though seemingly secure in the possession of power, and though created Duke of Orkney by the unfortunate Queen, he soon found that his conduct had aroused the indignation of the kingdom. A confederacy was formed against him by the barons, the Queen was liberated from his power and he escaped to the Orkneys and afterward to Norway. The Danish authorities kept him imprisoned for some time at Malmö, latterly at Drangholm in Zeeland, where he died insane. See the various histories of Scotland, and the ‹Life of Bothwell› by Professor Schiern (English translation 1880).

BOTHWELL, Scotland, village of Lanarkshire, on the north bank of the Clyde. It is situated eight miles southeast of Glasgow and about one mile beyond it stands Bothwell bridge, where a decisive battle was fought in 1679 between the Scottish Covenanters, commanded principally by their clergy, and the royal forces, commanded by the Duke of Monmouth, in which the former were totally routed. Near the village are the fine ruins of Bothwell Castle, once a stronghold of the Douglases. Pop. 3,452.

BOTOCDOS, or **AYMORES,** a Brazilian race of Indians. They live 70 to 90 miles from the Atlantic, in the virgin forests of the coast range (Serra do Mar or Serra dos Aymores), on the borders of the forests of Minas-Geraes and Espirito-Santo, especially on the Rio Doce. They receive their name from the custom which they have of putting a slit in their under lip and in the lobes of their ears, and inserting in these, by way of ornament, pieces of wood shaped like the bung of a barrel (Portuguese *botoque*). They have oblique eyes and projecting cheekbones. Their color is a dirty brown. They go quite naked and paint their bodies, and a Botocudo warrior with his lip and ear plugs, his body painted black and red and his face bright red, strongly reminds one of a denizen of the infernal regions. They are very skilful with the bow and arrow, and live chiefly by hunting. They now number only a few thousands and are decreasing.

BOTOSHANI, bō′tō-shän′y. Rumania, town and department capital of Moldavia, on an affluent of the river Jija, 60 miles by rail northwest of Jassy. The commercial centre of a rich farming and pastoral region, it has an extensive domestic and export trade with Turkey and England in grain, cattle, lumber and petroleum, large flour and starch mills, sugar and glass factories. The town takes its name from Batus Khan, a Tatar chief, grandson of Genghis Khan, who invaded the country in the 13th century. Pop. (about two-thirds Armenians and Jews) 35,000.

BOTRYCHIUM, bō-trĕ′chĭ-ŭm, a genus of fern (adder's-tongue), of the sub-order *Osmundeæ* and tribe *Ophioglossaceæ,* characterized by its distinct *thecæ* in a compound spike attached to a pinnate or bipinnate frond. The common American species are: *B. lunaria,* common moonwort, which grows on elevated lands and pastures where other ferns are seldom found. It was once supposed to possess great virtues, both magical and medicinal, and was carefully gathered by the light of the moon. *B. virginicum,* the largest of the species, is known by the name of rattlesnake fern, from growing in places frequented by that dangerous reptile. It abounds in many parts of the United States, Mexico and Australia and in the Himalaya Mountains in Asia. In Europe it is found only in Norway. *B. lunaria* is found from New England to Colorado and Lake Superior. *B. simplex* abounds from California and the Yellowstone to Lake Superior. Other generally diffused species are *B. lanceolatum, B. lunarioides* and *B. ternatum.*

BOTRYTIS, bō-trī-tĭs, a genus of fungi belonging to the section Hypomycetes and familiar by name to cultivators from its connection with the potato disease. The genus contains a number of those minute plants known as molds and mildews, and of these some have the peculiar habit of growing in the tissues of living vegetables. The threads of which their growth consists creep among the loose cells of the under side of leaves and send up their fertile shoots through the stomata. Many kinds of *Botrytis* are extremely destructive to various plants, but many fungi diseases formerly ascribed to species of *Botrytis* are now known to be caused by other genera. The decay of the leaves and stem in the potato disease is now charged against *Phytophthora infestens,* but old writers attribute the troubles to *B. infestens.* Though extremely injurious to the farmer, these molds are sometimes very serviceable by destroying weeds. Various agricultural pests may often be seen looking yellow and unhealthy, when an examination of the under side of the leaves will show that this is owing to the ravages of these minute parasites.

BOTSFORD, George Willis, American scholar: b. West Union, Iowa, 9 May 1862; d. New York, 13 Dec. 1917. He was graduated from the University of Nebraska in 1884 and received his Ph.D. degree from Cornell in 1891. He was instructor in Greek and Roman history at Harvard from 1895 to 1901, became adjunct professor of history at Columbia University in 1903 and full professor in 1906. Professor Botsford was recognized as the leading American scholar in the domain of ancient history; his textbooks are regarded as standard authorities on the subject. He spent several years in historical research in Italy and was a member of the board of editors of the *Political Science Quarterly.* Among his numerous works are ‹A History of Greece for High Schools›; ‹The Story of Rome›; ‹History of the Ancient World›; ‹Hellenic Civilization›; ‹Development of the Athenian Constitution›; ‹An Ancient History›; ‹A Source Book of Ancient History.›

BOTTA, Carlo Giuseppe Guglielmo, Italian statesman, historian and poet: b. San Giorgio del Canavese in Piedmont, 6 Nov. 1766; d. Paris, 10 Aug. 1837. During the time of the French Revolution he was a student of medicine at Turin, and adopting revolutionary opinions with enthusiasm, he suffered for his zeal by two years' imprisonment (1792–94). After passing as a physician he entered the French service and accompanied the expedition which Napoleon sent to Corfu and he was soon after elected as a member of the provisional government of Piedmont. When this territory was, in 1803, annexed to the French empire, Botta was elected a member of the Corps Législatif, where his behavior was characterized by a bold opposition to the Emperor. During the «Hundred Days» he was rector of the academy at Nancy and after the second return of the Bourbons he went in a like capacity to Rouen. The greater part of the remainder of his life was passed by him as a private gentleman at Paris. His chief works belong to the department of history. Among these are ‘Storia della Guerra dell' independenza degli Stati Uniti d'America’; ‘Storia d'Italia dal 1789 al 1814’ (10 vols.). He also furnished a continuation to Guicciardini's Italian History from 1490–1534, bringing it down to 1789.

BOTTA, Paul Emile, French traveler and archæologist: b. about 1805; d. Poissy, April 1870. He was a son of Carlo Giuseppe Botta (q.v.). While still very young he made a voyage round the world, traversed the western portion of America and took part as physician to Mehemet Ali in an expedition which set out from Egypt to Sennaar, of which he took advantage to make a considerable zoological collection. At a later period he was appointed French consul at Alexandria and from this place he undertook a journey to Arabia in 1837, the scientific results of which he communicated to the world in his ‘Relation d'un voyage dans le Yémen.’ His chief service to science consists in his having discovered the ruins of ancient Nineveh, a discovery made by him in 1843 in the course of excavations in the neighborhood of Mosul, which he conducted with great energy and ability while acting as consular agent for the French government at that town. As the result of investigations made upon the spot he published two important works, one on the cuneiform writing of the Assyrians, ‘Mémoire de l'écriture cunéiforme Assyrienne,’ and the other upon the monuments of Nineveh, ‘Monuments de Ninive’ (5 vols., folio, with drawings by Flandin, Paris). The latter is a work of great splendor and marks an era in Assyrian antiquities. From 1847 to 1857 Botta lived as French consul-general in Jerusalem and from 1857 to the end of his life in the same capacity at Tripoli.

BOTTA, Vincenzo, Italian scholar: b. in Piedmont, 11 Nov. 1818; d. New York, 5 Oct. 1894. He was elected to the Sardinian Parliament in 1849 and in 1853 was sent to the United States on a mission to investigate the American educational system. New York pleased him so well that he settled there and was appointed professor of the Italian language and literature in the University of New York. In 1855 he married Anne Charlotte Lynch; their home became a meeting place for literary people and artists. She founded at the Académie Française a quinquennial prize of $1,000 for the best essay on «The Condition of Woman.» She died 23 March 1891. Botta published ‘Dante,’ ‘Modern Philosophy in Italy,’ a life of Cavour and other studies.

BOTTALLA, bŏt-tal′la, **Paolo,** Italian historian: b. Palermo, Sicily, 1823. After education at the Jesuit colleges in Palermo and Rome he held professorships in theology and church history in both cities and later at the College of Saint Bruno, Wales, and in Poitiers. His works written in Italian, French and English include ‘Corso di storia e di geografia universale’ (1860); ‘Pope Honorius before the Tribunal of Reason and History’ (1868); ‘The Pope and the Church considered in their Mutual Relations’ (2 vols., 1868–70); ‘The Papacy and Schism’ (1869); ‘La composition des corps d'après les deux principaux systèmes qui divisent les écoles catholiques’ (1878); ‘L'autorità infallibile del Papa nella Chiesa e le sue relazioni collo stato’ (1880).

BOTTARI, Giovanni Gaetano, Italian prelate: b. Florence 1689; d. 1775. After completing his studies he was admitted a member of the Academy della Crusca and spent six years in preparing the celebrated dictionary of that body. After having been in charge of the grand-ducal printing office, he left Florence in 1730 and settled in Rome, where Pope Clement XII appointed him professor of ecclesiastical history and polemics in the Collegio della Sapienza; the same year he was appointed palatine prelate. He assisted the geometer Manfredi in examining the course of the Tiber from Perugia to the mouth of the Nova, with the view of rendering it navigable and providing a remedy against its devastating inundations. The excellent report on the subject, though signed by Manfredi, is said to have been drawn up by Bottari. He was rewarded by the appointment as keeper of the Vatican library. Among his works are ‘Lectures on Boccaccio, Livy and Dante’; a splendid edition of Virgil with a learned preface and notes and a corrected edition of Vasari's ‘Lives of the Painters.’

BOTTESINI, bŏt′te-zē′nē, **Giovanni,** Italian musician: b. Crema, Italy, 24 Dec. 1823; d. 7 July 1889. He was taught the double-bass in Milan, by Luigi Rossi, according to the method of Andreoli and Dragonetti, and soon became a first rate performer, meanwhile studying musical composition under several distinguished masters. When scarcely 23, he was engaged as contrabassist for the Italian opera in Havana, where in a few seasons he rose to the post of *maestro* and musical director of the company. Here he produced in 1846 his first opera, ‘Cristoforo Colombo.’ During the five years of his stay in Havana, he paid occasional visits to the United States, where he secured considerable fame by his wonderful performances in the concert room. His masterly handling of the huge instrument took everybody by surprise, while his style, at once elegant and impressive, won the admiration of all critics and amateurs. His success on his return to Europe in 1851 was not less complete; the concerts he gave in London and Paris established his reputation as the first living contrabassist. In 1853 he returned to the United States with M. Jullien, and afterward accompanied Madame Sontag to Mexico. Subsequently he became director of the orchestra at the Italian opera in Paris, where his opera ‘L'Assedio di Firenze’ was successfully performed during the spring of 1856. Other works are ‘Ali Baba’ (1871); ‘Ero e Leandro’ (1879); ‘Garden of Olivet’ (1887), an oratorio. He also published numerous overtures, symphonies and quartettes.

BOTTICELLI, bôt-tĭ-chĕ'lē, **Sandro**, Italian painter of the Early Renaissance: b. Florence, probably in 1444; d. there, 17 May 1510. The son of a tanner, his real name was Alessandro di Mariano dei Filipepi. According to Vasari, young Sandro derived the name of Botticelli from a goldsmith named Botticello, whose name he assumed. Modern research, however, tends to show that an elder brother, Antonio, was a goldsmith and gold-leaf-beater, and it is believed that the boy was first put to work with him. The eldest brother, Giovanni, a prosperous broker, appears to have cared for the boy. Giovanni bore the sobriquet of «Botticello» or «Little Barrel» and from him the young artist was named Botticelli. As he gave evidence of a strong bent towards art, the youth was apprenticed in 1458–59 to the painter Fra Filippo Lippi (q.v.), with whom he remained for eight or nine years. During that period he was undoubtedly employed with other pupils upon Lippi's greatest masterpiece, the series of frescoes in the church of the Pieve at Prato. This work was completed in 1465 and Botticelli returned to Florence. He did not accompany Lippi when the latter went to Spoleto in 1467 to decorate the cupola of the cathedral at Spoleto, though it is probable that he assisted the master in preparing his designs. After Lippi's death, his natural son, Filippino, then nine years old, entered Botticelli's studio in Florence and received his early training from his father's most distinguished pupil. Botticelli had meanwhile become connected with the brothers Pollainolo (q.v.), whose influence is most strongly marked in his work of that period. The brothers had executed six panels for the tribunal of the Mercatanzia representing six Virtues. To these Botticelli added the seventh, Fortezza (Fortitude), about 1470, presenting a young woman partly clad in armor, seated in a recess on a throne of colored marbles. The attitude and expression of the figure have won the admiration of all art critics for their fine, imaginative conception. To this period also belong two small panels of Judith and Holofernes, now in the Uffizi Gallery in Florence. In his youth Botticelli came under the spell of ancient mythology and there are extant several works by him on classical subjects, the finest being his ‘Birth of Venus’ in the Uffizi and ‘Venus and the Graces’ in the Florence Academy. Two smaller examples of this style are in the National Gallery, London, which also contains one of his earliest pictures extant, the ‘Adoration of the Magi.’ In 1473–74 he was commissioned by Lorenzo dei Medici to paint a ‘Saint Sebastian’ for the church of Santa Maria Maggiore. In this work the serene beauty of the martyr's face reveals the poetry and mystic elevation of the artist's thought. The fine landscape background, with steep rocks and towers on the shore of a distant sea, was to serve as a model for many of his contemporaries and followers in future days. In the early years of his rising fame Botticelli became acquainted with another young Florentine painter, his junior by eight years, Leonardo da Vinci, then growing up in the workshop of Andrea del Verrocchio, goldsmith, painter and sculptor. The long lost ‘Chigi Madonna’ of Botticelli, which was rediscovered nearly 40 years ago in a dark corner of Prince Chigi's palace in Rome, is a beautiful expression of charming naïveté, refinement and delicacy. The picture is now the property of Mrs. John Lowell Gardner of Boston, Mass. A more ambitious ‘Adoration of the Magi’ than that already referred to is the painting now in the Uffizi. It was painted probably about 1470, to order; it contains over 70 figures cleverly arranged and shows Botticelli as a master of portraiture, for the kings and their satellites were at once recognized as Cosimo de' Medici, Botticelli himself and various members of the Medici family and Florentines of high rank. About this time the painter secured the patronage of the powerful Medici and other great families. Pope Sixtus IV called him to Rome in 1481 to assist in the decoration of the new chapel in the Vatican, now known as the Sistine Chapel. Associated with him in this work were some of the leading artists of the time, Ghirlandaio, Cosimo Roselli, Perugino and Pinturicchio. Internal evidence shows that Botticelli did much work on the series of papal portraits in the niches between the windows. He also spent 18 months on three frescoes — ‘Life of Moses,’ ‘Temptation of Christ’ and ‘Destruction of Korah, Dathan and Abiram.’ About 1484 Botticelli returned to Florence and continued to execute works for the great families of Florence. His fame was now widespread, and in 1490 Lorenzo the Magnificent appointed him on a commission to complete the cathedral façade. The famous ‘Nativity’ in the London National Gallery belongs to this maturer period and the tax list of 1498 shows him the possessor of «a gentleman's villa.» He was buried in the family vault in the church of Ogni Santi. He is said to be one of the engravers of a celebrated series of illustrations executed by Florentine artists toward the close of the 15th century, notably a set of designs for the ‘Divina Commedia’ of Dante, of which 686 are in the Berlin Museum. His works are to be found in various European galleries, his Madonnas being especially characteristic of his style. In these the Virgin appears peculiarly slender and with a melancholy expression as if oppressed by forebodings. He was greatly esteemed by his contemporaries, but subsequently fell into disfavor. Although opinions as to his merits differ widely, Botticelli is to-day very popular and forms the theme of much art discussion. Consult Ulmann, ‘Sandro Botticelli’ (1893); Pater, ‘Studies in the History of the Renaissance’ (1873); Phillimore, ‘Botticelli’ (1894); Berenson, ‘Florentine Painters of the Renaissance’ (1898); Supino, ‘Sandro Botticelli’ (1900); Steinman, ‘Botticelli’ (English translation 1901); Kroeber, ‘Die Einzelporträts des Sandro Botticelli’ (1911).

BOTTIGER, Karl August, German archæologist: b. Reichenbach, Saxony, 8 June 1760; d. Dresden, 17 Nov. 1835. A student and teacher at Leipzig, in 1791 through Herder's influence he became director of the Weimar gymnasium and acquainted with Goethe, Wieland, Schiller and others. In 1804 he went to Dresden as special lecturer on classical antiquities and art. Two years before his death he was elected a member of the French Institute. His literary output was enormous. His principal work is a study of the domestic life of Roman women 'Salina, oder Morgenscenen einer reichen Römerin' (2 vols., Leipzig 1803; 3d ed., Munich 1878).

BOTTLE, a vessel designed to hold liquids, constructed of various materials and in various forms according to the necessities of local manufacture and the demands of the kind of liquid to be enclosed. It is now understood to mean a vessel made of glass, with a more or less narrow neck and mouth. In ancient times, however, the bottle was nothing more than a skin of some animal. Thus the Biblical aphorism concerning the putting of new wine into old bottles as an illustration of folly means that it would not be wise to trust a new wine, while yet active with fermentation, to the chance of bursting a leathern vessel necessarily weakened by use and age. In Spain, Turkey, India and some parts of South America to this day, various skins, and especially that of the goat, are used for containing wine and water. The hide is stripped from the animal as entire as possible and the various natural openings having been sewed up, with the exception of that of one of the legs, which is retained as a nozzle, the vessel is ready, after a certain preliminary curing of the skin, for the reception of the wine. The peculiar taste of Amontillado sherry is supposed to be owing to the fact of its being kept in leather. The ordinary bottle is, however, of glass. The various bottles used for different well-known purposes are generally distinguished by peculiar shapes and sizes, as, for example, the English wine, beer, ale and soda bottles, the French champagne, Burgundy and claret, and the Rhenish wine bottles. Port wine is occasionally put into very large bottles, called magnums, and acids in still larger ones termed carboys. Until 1880 bottles were made by hand. The bottle blower gathered the molten glass on the end of his blow-pipe through which he blew with his mouth, producing a hollow ball. When this was large enough it was placed in an iron mould to shape it and was then blown into its permanent shape. The molds were made of brass or iron kept at nearly a red heat when in use. A common form was of the two sides hinged together. The invention of blowing machines has revolutionized the industry by enabling greater numbers to be produced and by greatly reducing the cost. In machine operation the glass is melted in the usual way in a furnace and is then run into a revolving pot about 20 feet in diameter. The object is to have a constant fresh surface of hot glass into which the gathering mold is dipped. The gathering molds are affixed to a revolving table and are generally in three pieces, a bottom and two hinged body sections. The proper quantity of glass is placed in a mold which is automatically closed as the table revolves. It comes next under a plunger by which the mold is firmly closed, the neck of the bottle formed and the bottle blown to the desired shape by compressed air which is automatically admitted at the correct moment as the mold-table revolves. In the next stage the mold is automatically opened and the hot bottle removed when the mold proceeds to the next cycle of operations. The bottle is then placed in an annealing oven and is allowed to cool very gradually. The average bottle machine has a capacity of over 100 gross a day as compared with 15 gross a day for three men and three boys under the old hand system.

BOTTLE CHARTS, maps of the terminal points of the voyages of sealed bottles thrown into the sea and either drifting to land or picked up afloat. These bottles had long been used by the victims of shipwreck to convey messages or record their fate, or by travelers or seamen for joke or experiment; but the first serious note taken of them was by Lieutenant Beecher of the British navy, who in 1843 published in the *Nautical Magazine* a Mercator chart of the Atlantic coast from lat. 6° S. to 63° N., or say from Cape Saint Roque, in Brazil, to Hudson Strait, with straight lines from start to finish of a number of bottle voyages he had noted, the length of these lines, time elapsed since set afloat, etc. Of course some bottles leak and founder and others are crushed; but he was able to collect 119 bottles, one of which had traveled 3,900 miles in a straight line, and of course far more in fact, and four over 2,000, while the time of voyage varied from three days to 16 years. This chart has been repeatedly freshened up with new facts, re-engraved and republished in the *Nautical Magazine*. Later, several government departments, of which the United States Hydrographic Office is by far the chief, have used this method systematically for the study of ocean currents. The office furnishes shipmasters with papers for inclusion in bottles, containing requests in several different languages for their delivery, with date and circumstances of finding, to the nearest United States consul, who will forward them to Washington. By this means three or four hundred new bottle voyages have been registered, with curious results. In general, their track is remarkably uniform, given the same local conditions. Of two bottles thrown out from the *Blonde* within five days in 1826 (one of Beecher's list), one was picked up 14 and the other 16 years after at the same spot on the French coast. Yet the effect of local winds is so great that of two set afloat simultaneously at the same spot, one was picked up on the Shetlands, the other on the west coast of France. Just north of the Azores, the surface conditions are so variable that of five bottles thrown out in one summer within 100 square miles, one drifted to the coast of Norway, two to the west coast of Ireland, one to France and one to Spain. The longest recorded voyage was about 8,500 miles, from the Allertons, south of the Falkland Islands, to the shore of the great Australian Bight, in a little less than three years. See CHART; MAP.

BOTTLE-TREE, a medium-sized Australian tree (*Sterculia rupestris*) of the family *Sterculiaceæ*. From the top of the globular stem, as from the mouth of a bottle, the branches extend. They bear lanceolate leaves two to four inches long and axillary panicles of inconspicuous flowers followed by leathery six-seeded follicles. The soft brittle wood is of little economic value, but the stems are said to contain much water, which is frequently obtained by the natives and by travelers. Some other allied species, also called bottle-tree, furnish edible mucilaginous roots which are largely used by the aborigines.

BOTTLENOSE, or **BOTTLEHEAD,** a small Arctic and north Atlantic whale (*Hyperoödon rostratum*) closely allied to the sperm whale, and so called from the dolphin-like shape of its head or snout, where the two pointed teeth are in the lower jaw. Placed farther back than ordinarily, and in smaller proportion, is a dorsal fin; the skin is smooth and glossy, lead-colored on the back, graduating into white on the belly. The largest are 30 feet long. These whales travel in small bands, generally keeping just south of the Arctic ice, and moving northward during the breeding season. They feed mainly on deep-water squids, for which they dive to great depths. Their chief value lies in the amount of oil and spermaceti that they yield.

BOTTLING, the process of enclosing liquids in bottles, including the operation of stopping or corking. The use of bottles for retaining liquids involves three requisites: that they shall be clean enough not to injure the purity, taste or looks of the contents, or the looks of the bottle, or to cause chemical action which will do so; shall be strong enough to resist probable pressure; and shall have stoppers which will not be disintegrated or corrode and will be tight enough not to let air in or volatile substances out, the degree of such precaution varying with the liquid. For scientific preparations, which include chemical analysis in criminal cases, an indispensable condition is that the bottle shall contain no impurities which would cast doubt on the result; hence chemists in such cases use only new bottles, cleanse them thoroughly with some preparation to remove external substances and expose them to a red heat before using. For common household use, as there is no bottling under pressure, the kind or weight of glass is of no importance. For cleaning, it is best to shake up with warm water and caustic soda and clean with a bottle-brush; to clean out gummy residues like paraffine from naphtha and gasoline bottles, shake up with sulphuric acid.

The material of the stopper is of the first importance. For scientific use, only glass is possible; as also to retain corrosive acids and perfumes that would pass through the pores of a cork, in which latter case also nice taste as well as security is a desideratum. In general family use, for volatile fluids like gasoline and naphtha and ammonia which might soak up and disintegrate the cork and let its gas escape, rubber is the usual stopper. In commercial bottling on a large scale, of beer, wine, mineral waters and carbonated beverages generally, the only stoppers used are cork and rubber, except in the case of siphons with valves. For wine, the old-fashioned long cork, driven deep in and pulled with a corkscrew, still holds the field. The common stopper for «soft› drinks, and in part for beer, is a "terraced" rubber one fastened to the under side of an iron cap and attached to the neck of the bottle by a wire loop whose leverage forces the rubber tightly into the mouth of it, and can be easily thrown off and the stopper removed. But in the United States, for beer even the rubber stopper is rapidly being displaced by a patent cork made in Baltimore, consisting of a crimped metal cap lined with cork, which a machine tightens around the neck of the bottle. It is easily lifted off by an iron ring, thrown over the neck and pulled up by a short handle; is much cheaper than the permanent rubber, and nearly as handy; and is cleaner, as good houses use only new ones. Indeed the use of old corks recleaned belongs to a low grade of goods. For milk bottles and others of which the corks are to last but a few hours and need no strength, pasteboard or wood-pulp is much used.

Old bottles, however, are used over and over; and here thorough cleanliness is a prime requisite, both for salability and because dregs of old liquor might ferment and ruin the new. If any corks have been driven in, they are extracted by machinery; for the rest, in the large establishments, the bottles are placed in rows of pockets on the surface of a large drum, which their weight, as the upper rows are added and the emerging ones taken off, causes to revolve slowly through a vat of hot solution of caustic soda, which enters the open mouths and eats out the sticky remnants of the last filling. They are then taken out and placed by sets, inverted, in a frame over revolving brushes, now consisting almost entirely of two or three rubber prongs held apart by strings or centrifugal force,— the old bristle brushes being disused because they wear out and leave bristles in the bottles,— at a speed of from 2,500 to 3,000 times a minute; then rinsed in frames of from two to four dozen vertical sprinkling tubes, over which the bottles are set, and jets of hot water forced into them. The filling is done by siphonage or air or gas pressure. A simple form for small breweries is an open trough filled from a barrel and supplying several siphon tubes which the operator starts by sucking them, shifting the bottles as fast as filled; the siphon is tilted up by the weight of the bottle enough to give a flow and the liquid in the trough is kept at a constant level by a float. But in the larger ones, a row of barrels or hogsheads is drawn upon by a set of rubber pipes with stop-cocks, to which the bottles are held and filled by means of air or gas pressure, one pipe having several branches. With carbonated beverages there is danger of the bottles bursting, and they are filled in iron cages open only at the top, to protect the workmen; with heavily charged waters in siphons, the latter are of tougher glass and are tested beforehand, and the men sometimes wear rubber coverings for face, hands or body. With flavored or sweetened drinks, the syrup is fed into the bottle from one spout while the carbonated water comes from another; in small works, however, the syrup is put in first and the bottle filled right-side up.

The recrimping of patent corks has been described; the old-fashioned long corks are shaped by a compressor and driven into the bottles by a plunger, operated either by hand or foot, or a self-feeder which can do 2,000 an hour. The corks are previously thrown into a hollow revolving drum for several hours, to rub against and batter each other, which knocks off the loose chips and shakes out the dust; then soaked and rinsed. There are wiring machines for either the small wires over the long corks, or the hinged wires with the rubber stoppers. The bottles when filled and corked are labeled by a machine, usually the bottles being laid in a crib with expansible sides and a plunger forcing them down against the label, which at the same time is picked up and moved under the bottle across a paste roll; sometimes the label is pressed against the bottle. The speed of this process is practically limited only by the ability of the workman to feed bottles to the machine. A special label is sometimes fitted over the cork, for security against refilling the bottles of a reputed firm with inferior liquors. Sometimes the corks have a stamp or brand burnt into them with a hot die pressed down by a machine. Finally, the corks are often covered with tinfoil or caps of some kind; the former is done by hand.

Much capital is invested in this business, and there is a national association composed of manufacturers. Returns are made by nearly all these firms and companies to the association, from which it appears that this industry employs nearly 30,000 persons; it serves 4,489,038 customers, owns 22,940 horses, employs a capital of nearly $51,000,000 and owns bottles to the value of $12,747,633. Its loss of bottles annually is $3,522,804. In this line are consumed annually, besides bottles, corks in great number, wire, patented arrangements for closing bottles, paper boxes for holding bottles, sealing wax and labels. The cost of these materials is given at $7,937,001. The capacity of corking-machines reaches 2,000 bottles per hour; that of labeling-machines 12,000 bottles daily. Consult Dreesbach, ‘Beer Bottler's Handy Book’ (Chicago 1906); Goosmann, ‘The Carbonic Acid Industry’ (ib. 1906); Sulz, ‘Treatise on Beverages’ (New York 1888).

BOTTOME, Margaret McDonald, American writer: b. New York, 29 Dec. 1827; d. 1906. She was long engaged in religious work in Brooklyn, N. Y., where her father held an official position. She accompanied him to almshouses and prisons and began to systematically visit the poor and sick of Brooklyn. After her marriage to Rev. Frank Bottome she began to give her whole time to this kind of work. For more than a quarter of a century she gave Bible talks in New York homes to the society women of the city. Out of these grew the order of the King's Daughters, which was destined to become a great organization of which she was annually chosen president until her death. In 1896 she was elected president of the woman's branch of the Medical Missionary Society, and she edited «Mrs. Bottome's Heart to Heart Talks with the King's Daughters» department in the *Ladies' Home Journal.* Among her published works are ‘Crumbs from the King's Table’; ‘A Sunshine Trip to the Orient’; ‘Death and Life’; ‘Seven Questions After Easter.’

BOTTOMLESS PIT, The. The translation of the Greek *ἀβύσσος* in the Authorized Version of the Scriptures, in the New Testament and Apocrypha. It is itself a translation of the Hebrew תהום. It means hell or the abode of evil spirits.

BOTTOMLEY, Horatio, English financier and journalist. He was for a number of years connected with a large financial undertaking in the city of London and was a pioneer of gold mining in West Australia. He founded the *Financial Times,* but is most widely known as the proprietor and editor of *John Bull,* in which he has long advocated a «business government» for the United Kingdom. His exposures of financial and other schemes of a doubtful character in its columns have involved him in successive lawsuits, in which he has sometimes, and with great skill, conducted his own defense. He sat as a Liberal in the House of Commons, 1906–12 and since 1918.

BOTTOMRY is the hypothecation or pledge of a vessel for the payment of a debt. The creditor has no right to take possession of the ship until the expiration of the time for which the loan is made, and then (under a bottomry contract in the usual form) only by the intervention of an admiralty court. If the loan is not repaid at the stipulated time, the lender applies to an admiralty court, which (the truth of the claim being established) decrees a sale of the ship to satisfy the debt. The conditions of such a contract usually are that, if the ship is not lost or destroyed by those risks which the lender agrees to run, the debt is to become absolute. The risks assumed by the lender are usually the same as are enumerated in a common policy of insurance. If the ship is wholly lost in consequence of these risks, the lender loses his loan. In case of a partial damage, the bottomry bond usually provides that this damage shall be borne by the lender in the proportion of the amount loaned to the value of the ship. If this amount is equal to half the value of the ship, the lender is to bear half the amount of such loss, etc. As the lender thus assumes a certain risk, he is justly entitled to a greater interest than if he did not thus take the hazard of the loss of the whole loan; and this is called «marine interest.» He is entitled to the usual rate of interest on his loan, in addition to the usual premium of insurance for the same voyage or period. The stipulation for such a rate of marine interest is not a violation of the laws against usury, for it is not merely a compensation for the use of the money lent, but also for the risk assumed. The shipowner may borrow money on bottomry whether his vessel be in port or at sea. But the captain of the ship, as such, cannot so borrow when in the port where the owner resides or near enough to consult him on any emergency. In any other port he may pledge the ship on bottomry for the purpose of raising money necessary for repairing, supplying and navigating her, if he can obtain it in no other way. If he borrow thus without necessity the bond is void and the lender can look only to the personal responsibility of the captain.

BOTTS, John Minor, American legislator: b. Dumfries, Va., 16 Sept. 1802; d. Culpepper, Va., 7 Jan. 1869. He studied law and in 1833 entered the Virginia legislature. He was elected to Congress in 1839, where he served three terms — (1839–43) and (1847–49). Upon the outbreak of the Civil War he asserted his devotion to the Union and in 1862 he suffered imprisonment on that account. After the war he published ‹The Great Rebellion, Its Secret History, Rise, Progress and Disastrous Failure› (1866); was one of Jefferson Davis' bondsmen, and attended the convention of Southern Loyalists in Philadelphia.

BOTULISM, bŏt'ū-lĭsm, a form of poisoning due to the eating of tainted sausages, ham, head-cheese or other impure meats. It is really due to a specific saprophytic bacillus, *B. botulinus.* Other organisms occurring in diseased or decomposed meat, and giving rise to similar symptoms, are *B. enteritis, B. coli* and *Proteus vulgaris.* These generate toxins, some of which are responsible for the symptoms, which are those of acute gastro-intestinal irritation. There is usually a period of from 12 to 24 hours (even 48 hours) after the eating of the meat before symptoms develop. The symptoms are various; they may be intense muscular weakness, with sudden nausea and vomiting; chills, small rapid pulse, cold extremities, headache and pain are also present. Following the chilly sensations the temperature may rise, even to 103° or 104° F. Cramps, delirium, hallucinations, diarrhœa and intense prostration may also be present. In some sudden and severe cases death has resulted with cholera-like symptoms. The eating of putrid meat and fish is common in many countries, but it is only when a specific bacillus happens to be present that toxic symptoms arise. Recovery is very protracted. Many of the cases resemble internal hæmorrhage, and great difficulty sometimes exists in the diagnosis. There are, however, more intestinal symptoms as a rule in meat poisoning (ptomaine poisoning). Abstaining from all tainted meats is the sole preventive. See POISONS.

BOTURINI BENADUCI, bŏt-ū-rē'nē bā-nä-doo'chē, **Lorenzo,** Italian antiquarian: b. Milan, about 1702; d. Madrid, about 1750. In 1736 he went to Mexico and traveled there among the Indians, collecting a large number of their writings and valuable Spanish records; these finally came into the possession of the Mexican government and have been mostly lost or destroyed. He afterward lived in Spain, where he held the office of historiographer for the Indies. He wrote ‹Idea de Una Nueva Historia de America,› which includes a valuable catalogue of his collections.

BOTZEN, or **BOZEN** (Italian **BOLZANO),** bŏl-tzä'nō, Italy, a district and a town in the Tyrol, south of Innsbrück, at the confluence of the Talfer with the Eisack. The town is well built, flourishing and surrounded by a wall two miles in length, built to protect it from a mountain torrent close by. The parish church is a Gothic building of the 14th century with an elegant spire; adjoining it is the new cemetery. The other objects worthy of notice are the church of Saint Nicholas, a gymnasium, custom-house, two monasteries, a normal school and a nunnery. Across the Talfer from Botzen is the winter resort of Greis. Botzen has an important transit trade and has four annual fairs, resorted to by commercial travelers from all parts of Italy and Germany. In the environs wine and fruits are produced. Pop. about 24,126.

BOUCH, bousch, SIR **Thomas,** English civil engineer: b. Thursley, Cumberland, 22 Feb. 1822 d. Moffat, 30 May 1880. He was early attracted to engineering studies, and in 1839 began his apprenticeship to a civil engineer in the north of England. He was a resident engineer on the Stockton & D. Railway for a period of four years, and in 1849 went to Scotland as manager and engineer of the Edinburgh & Northern Railway. While in the service of this company he devised a sort of floating railway for carrying goods trains across such estuaries as those of the Forth and Tay. After this he was for a time engaged in railway construction in England. He was engineer of the first railway bridge across the Tay, which was completed in September 1877 and opened in May of the following year. For this he received the freedom of Dundee and in 1879 the honor of knighthood. On 28 December of that year the bridge gave way during a stormy night, while a train with some 70 passengers was crossing. All were drowned, and the accident caused such severe mental distress to Sir Thomas that it undoubtedly hastened his death.

BOUCHARDON, boosh-är-dŏṅ, **Edmé,** French sculptor: b. Chaumont-en-Bassigny 1698; d. Paris, 27 July 1762. He was a pupil of his father, Jean Baptiste Bouchardon, sculptor and architect, and then went to Paris and entered the school of the younger Coustou. In 1722 he gained the highest prize and was made royal pensioner at Rome. There he executed a number of busts, including that of Pope Clement XII. After nine years' absence, the Duke d'Antin recalled him to Paris and gave him a studio at the Louvre. He assisted in repairing the fountain of Neptune at Versailles and executed 10 statues which adorn the church of Saint Sulpice. The fountain in the Rue de Grenelle, which the city of Paris ordered to be constructed in 1739, was made by him and is considered his masterpiece. The execution of the greatest monument of that period, the equestrian statue of Louis XV, which was erected by order of the city of Paris, was committed to him. He labored 12 years on this with inconceivable perseverance, and has left in the horse a model which may be ranked with any work of antiquity. His pieces bear the character of simple grandeur, but, in general, more fire is to be desired in his sculpture. Latterly he adopted a more polished, delicate manner, to suit the taste of the age. Caylus has written his life. His brother, Jacques Philippe Bouchardon, was court painter to the King of Sweden, and modeled a great number of figures for the Royal Palace at Stockholm.

BOUCHER, boo-shā, **Alfred,** French sculptor: b. Bouy-sur-Orvin 1850. He studied under Dumont and Paul Dubois. He was awarded the second Roman prize in 1876. His ‹Au Bout,› now in the Luxembourg, was awarded a gold medal in 1886. Other works of note are ‹A la Terre,› ‹Repose› and ‹Diana Surprised.› In 1900 he won the Grand Prix at the Paris Exposition.

BOUCHER, boo-shā', **François,** French painter: b. Paris, 29 Sept. 1703; d. 1770. He was the son of a designer of embroideries, who was his first teacher. Later he studied with Lemoyne and then took up engraving as a means of livelihood; at 20 he won the first prize at the Académie. In 1723 he won the

Grand Prix de Rome and in 1725 he made a journey to Italy, in company with Carle Van Loo, and remained there for six years. The painters of decadence, with their lightness and skill, were the ones who most influenced him, and he is in a manner their continuer,— their art freshened, however, by his youth and the national quality of grace of the Frenchman. His success on returning to Paris was immediate and orders for work of all kinds flowed in on him. He painted religious and mythological subjects, landscapes, decorations and especially portraits, being the favorite of his period among the courtiers and wealthy people, particularly for women's portraits. Despite a life in which the pleasure-seeking of his time played a very large part, he was industrious to a degree — the number of his drawings being, at his own estimate, about 10,000. He was in high favor with Madame de Pompadour, whose portrait he painted and who engraved some of his works. He was made inspector of the Gobelins factory in 1755 and court painter in 1765. His Watteau-like style and graceful voluptuousness gave him the title of the Anacreon of painting. The Louvre gives a sufficient idea of his style in such well-known works as the ‹Rinaldo and Armida,› ‹Toilette de Vénus,› ‹Shepherd and Shepherdesses› and the ‹Artist's Portrait.› At Amiens we find his ‹Rape of Europa,› at Fontainebleau his ‹Venus and Cupid›; the Metropolitan Museum in New York has his ‹Arion Rescued›; at the Stockholm Museum is his ‹Leda and the Swan,› while the Wallace collection in London possesses a ‹Diana leaving the Bath,› by him. Among Boucher's many pupils was Fragonard. After the Revolution, with David in authority, Boucher was pitilessly scorned, his works were considered the very type of falsity and they fell to the most absurdly low prices. To-day we esteem him once more — in a fashion nearer that of his contemporaries. He is absolutely the man of his century: light but of consummate grace. Consult Mantz, ‹Boucher, Lemoyne and Natoire› (1880) and the monograph by Kahn (Paris 1905).

BOUCHER, bow'chėr, **Jonathan**, English clergyman: b. Blenoog, 12 March 1738; d. Epsom, 27 April 1804. He came to America about 1754 as private tutor in a Virginia family. He continued teaching and tutoring for several years, during which time he counted among his pupils the stepson of George Washington. He returned to England, where he received Episcopal ordination in 1772. He came back to America and had charge of several ecclesiastical parishes in Virginia, Maryland and Carolina. He was on intimate terms with many of the prominent leaders of the colonies, among them being Washington, with whom he often dined and discussed the affairs of the country. Boucher's loyalty to the English Crown was uncompromising, and when the Revolutionary War broke out he denounced from the pulpit the revolutionary doctrines then popular in the colonies. So strong was the popular sentiment against him that he preached his last sermon with pistols on his pulpit cushion. He broke with Washington and his other American friends, and finally he was forced to resign his parish and return in 1785 to England, where he found himself as popular as he had been unpopular in America. His loyalty to the Crown was rewarded with a government pension and the vicarship of Epsom, Surrey, which he retained till his death. Boucher was considered one of the best preachers and orators of his time both in England and the colonies. Under the title ‹A View of the Causes and Consequences of the American Revolution› he published, in 1797, 15 sermons delivered between 1763 and 1775. These he dedicated to Washington, notwithstanding the break in their friendship. These sermons are interesting on account of the political anecdotes they contain. Boucher left, at the time of his death, the uncompleted manuscript of a ‹Glossary of Archaic and Provincial Words› upon which he had spent 14 years. Several unsuccessful attempts were made to publish this manuscript, which, it is said, finally became the property of the publishers of ‹Webster's English Dictionary.›

BOUCHER, boo-shā, **Pierre**, French pioneer in America: b. Perche, France, 1622; d. Boucherville, Canada, 20 April 1717. He came to Canada in 1635, took part in the wars with the Iroquois and was sent to France in 1660 as a deputy for the colony of New France. He was later made governor of Three Rivers. He wrote ‹Histoire véritable et naturelle des moeurs et des productions de la Nouvelle France› (1663). Shortly before his death he addressed to his children ‹Les adieux du grand-père Boucher.›

BOUCHER DE CRÉVECŒUR DE PERTHES, Jacques, French anthropologist: b. Réthel, 10 Sept. 1788; d. Abbeville, 5 Aug. 1868. Through his father, an active botanist, he came under the notice of Napoleon and was employed in numerous missions to Italy, Germany, Austria and Hungary. After the Restoration he lived at Abbeville, where he was most active as president of the Society of Emulation. He wrote travels, poems and an early apology for free trade, but only his works on the archæology of man are of consequence now. The first, ‹De la Création› (5 vols., 1839–41), already brought him some reputation, but his long investigations on stone weapons and other remains of early human civilization in the Tertiary and older Quaternary Diluvial strata made him famous. His most striking discovery was that of a fossil human jawbone in the quarries of Moulin-Quignon, near Abbeville, in 1863. Other works of great value are ‹Antiquités celtiques et antédiluviennes› (3 vols., 1846–65); ‹De l'homme-antédiluvien et ses œuvres› (1860). Consult ‹Recollections of M. Boucher de Perthes› in Lady Prestwich's ‹Essays Descriptive and Biographical› (London 1901).

BOUCHES-DU-RHONE, boosh dü rōn («Mouths of the Rhone»), France, department in the south, in the ancient government of Provence, bounded north by Vaucluse, west by Gard, east by Var and south by the Mediterranean. Chief town, Marseilles. Area, 2,025 square miles, of which about half is under cultivation, the remainder being occupied by forests, heaths, wastes, water, etc. Between the Rhone and the lagoon of Berre is the great plain of La Crau. Its borders are tolerably well cultivated and support a number of cattle, but the centre is little better than a desert of stones and pebbles, affording, however, winter pasture for sheep. The Rhone is the principal river; near Arles it divides into two branches which enclose an island called La Camargue. Several canals facilitate transport and are especially useful for irrigation. The climate is generally very warm, with little rain during the summer. A cold and generally violent wind, called mistral, always blows from the Cevennes after rain. It lasts from 3 to 9, sometimes, though rarely, even 12 days, and dries up the ground with astonishing rapidity. The soil of the department is for the most part arid and unproductive without irrigation. Vines, however, thrive and almonds, figs, capers, nuts, cereals, grapes, vegetables, mulberry trees, silkworms, and particularly olives, are extensively cultivated. The minerals are of little commercial importance; lignite, iron, lime, building stone, cement and marble are obtained. Salt is extensively manufactured from the lagoons, and the saltworks of Berre are celebrated both for the quality and quantity of their product. The articles manufactured, besides salt, are principally soap, brandy, olive oil (the best in France), soda, chemicals, vinegar, scents, leather, glass, etc. The fisheries are productive. Shipbuilding, metal-founding and distilling of oil are also important industries. The department includes the three arrondissements of Marseilles, Aix and Arles. Pop. 805,532.

BOUCHETTE, Joseph, French-Canadian engineer: b. 1774; d. 1841. He entered the naval service in 1791, served during the War of 1812 and rose to the rank of colonel; went to England in 1814, where he published in 1815 his ‘Topographical Description of Lower Canada, with Remarks upon Upper Canada.’ He was engaged as surveyor-general of Quebec in delimitating the disputed eastern boundaries of Canada with the United States.

BOUCICAULT, boo'sē-kō, **Dion,** originally called **BOURCICAULT,** Irish dramatic author and actor: b. Dublin, 26 Dec. 1822; d. New York, 18 Sept. 1890. He was educated at London University and wrote his first play, ‘London Assurance,’ under the pseudonym of «Lee Morton» when he was only 19 years old. This was produced at the Covent Garden Theatre in London and won immediate success. He made his first appearance as an actor in 1852 in his own play, ‘The Vampire’; in 1853–60 he was in the United States, where his success on the stage was as great as it had been in England. He founded a theatre in Washington and reconstructed the Metropolitan Theatre in New York, but was not very successful as a manager. Returning to London in 1860 he brought out ‘The Colleen Bawn,’ one of his best-known plays, and was at one time joint manager of the Adelphi and manager of a new theatre, the Westminster. The latter venture was unsuccessful, but he shortly afterward brought out a number of very popular plays. In 1876 he came to New York, where he lived until his death. He continued his work as both actor and playwright, and also opened the New Park Theatre on Broadway. Boucicault wrote about 400 plays, many of which were adaptations; among the best not already mentioned are ‘Old Heads and Young Hearts’; ‘Love in a Maze’; ‘Used Up’; ‘Corsican Brothers’; ‘The Octoroon,’ dealing with the condition of the slaves in the United States; ‘The Streets of London’; ‘The Shaughraun’; ‘Daddy O'Dowd’; and ‘Foul Play,’ a dramatization of Charles Reade's novel of the same name. In ‘The Colleen Bawn’ he created one of his favorite types, the Irish hero that appears in many of his plays. He also rewrote and adapted ‘Rip Van Winkle’ especially for Joseph Jefferson's use. While writing his numerous plays he found time to engage in a political controversy with Lord Beaconsfield over the rights and liberties of the Irish people. He introduced many improvements in the staging of plays, being the first to use carpets on the stage and moving scenery.

BOUCICAULT, Mrs. **Dion,** English actress: b. 1833; d. 6 Nov. 1916. Before her marriage to Boucicault in 1853 she had won success as Agnes Robertson in ‘Our Clerks’ and other plays. After her marriage she came with her husband to the United States, but returned with him to London in 1860 and took important parts in several of his plays. She again came to the United States and was later separated from her husband.

BOUDIN, boo-dăṅ, **Eugène,** French painter: b. Honfleur, 12 July 1824; d. 8 Aug. 1898. He lived in Paris for most of his life, traveling somewhat in Brittany and Holland. He was devoted to the painting of seaports and river scenes, the gray expanses of French skies and waters, the picturesque confusion of ships in harbors. Among his works are ‘Fishing’; ‘The Meuse at Rotterdam’; ‘Low Tide’; ‘High Tide’; ‘Getting Under Sail’; ‘A Dutch Bark at Antwerp’; and ‘Bordeaux Harbor.’

BOUDINOT, boo'dĭ-not, **Elias,** American philanthropist: b. Philadelphia, 21 April 1740; d. Burlington, N. J., 24 Oct. 1821. He studied law at Princeton with Richard Stockton, and in 1760 commenced practice at Elizabethtown, N. J. He early became a devoted advocate of the patriot cause, and in 1774 was a member of the Provincial Convention which took the control of New Jersey out of Governor Franklin's hands. Congress appointed him commissary-general of prisoners, 15 May 1777; he was elected to Congress in 1777, 1780, 1781 and 1782, and was chosen its president 4 Nov. 1782, and as such signed the treaty of peace with Great Britain. He was director of the mint at Philadelphia 1795–1805, being appointed by Washington, whose trusted friend and counsellor he was throughout the Revolution and afterward. From 1772 to 1805 a trustee of the College of New Jersey (Princeton), he founded its cabinet of natural history with a liberal contribution. He was active in the organization of the American Bible Society, becoming in 1816 its first president. By his will he left the bulk of his large estate to various institutions and charities. He wrote ‘The Age of Revelation’ (1790), to counteract Paine's ‘Age of Reason’; ‘Oration 4 July 1793,’ before the New Jersey Society of the Cincinnati; ‘Second Advent of the Messiah’ (1815); ‘The Star of the West’ (1816), an attempt to identify the North American Indians with the descendants of the lost tribes of Israel.

BOUDINOT, Elias, Cherokee Indian: d. 10 June 1839. He was one of three Cherokee youths brought before Elias Boudinot (1740–1821) in 1818, and he received that philanthropist's permission to assume his name. He was educated at the mission school at Cornwall, Conn., and married a white lady of that place. He became a man of considerable talent and ability, and of influence among his people. In December 1835, he, with others of his nation, was persuaded to make a treaty with the United States. He was thereupon accused of having betrayed his country and was murdered by the John Ross party west of the Mississippi. He published ‹An Address to the Whites› (1826), delivered at Philadelphia, 25 May 1825, and edited the *Cherokee Phœnix*, 1828–34.

BOUDINOT, Elias Cornelius, Cherokee lawyer, soldier and legislator: b. near Rome, Ga., August 1835; d. Fort Smith, Ark., 27 Sept. 1890. The maiden name of his mother was Harriet Gold. Her father was a prominent citizen of Cornwall, Conn., where his father, Elias Boudinot (Galagina), a Cherokee Indian, had been educated. Left an orphan by the death of his mother in 1836 and the assassination of his father in 1839, he was reared under the guardianship of his step-mother (who, like his mother, was of New England parentage and birth) and of his uncle, Stand Watie. His education was begun in the tribal schools of the Cherokee Nation and completed in New England. Because of the factional troubles of the Cherokee Nation, in which his family had been so tragically involved, he located in Arkansas, where he read law and engaged in newspaper work. He was sent from Washington County as a delegate to the Secession Convention which met at Little Rock, 4 March 1861, and was chosen as secretary of that body. During the Civil War he represented the Cherokee Nation in the Confederate Congress at Richmond part of the time and was also in the military service, attaining the rank of lieutenant-colonel of the regiment known as the Cherokee Mounted Rifles. He took an active and prominent part in the protracted and fruitless Indian peace council which was held at Fort Smith, Ark., in September 1865, as also in the negotiation of the new treaties between the government of the United States and the Indians of the five civilized tribes, at Washington, D. C., during the spring and summer of 1866. He subsequently became an attorney for the Atlantic & Pacific Railway Company, in which capacity he took a radical stand in favor of the proposed individual allotment of the lands of the several reservations in the Indian Territory and the opening of the surplus lands to white settlement. By this course he incurred the bitter enmity of his fellow tribesmen and virtually exiled and expatriated himself from citizenship and residence in the Cherokee Nation. He was a man of fine literary taste and talent, excelling both as a writer and as a speaker. During his later years he continued in the active practice of the law at Fort Smith and at Washington, D. C.

BOUFFLERS, boo-flăr, **Louis François** (Duc de), French soldier: b. 10 Jan. 1644; d. Fontainebleau, 20 Aug. 1711. He saw active service under Condé, Turenne, Crequi, Luxembourg and Catinat, and was created a marshal of France in 1693. His defense of Namur in 1695, and of Lille in 1708, are famous. The siege of the former place was conducted by King William in person, and cost the allies more than 20,000 men. The latter was conducted by Prince Eugène. An order was sent from Louis XIV, signed by his own hand, commanding Boufflers to surrender; but he kept it secret until all means of defense were exhausted. The retreat of the French after their defeat at Malplaquet, under the direction of Boufflers, was more like a triumph than a defeat.

BOUFFLERS, Stanislaus, Chevalier de, French soldier and author (son of the Marchioness of Boufflers, mistress of Stanislaus, King of Poland): b. Lunéville, 31 May 1738; d. Paris, 18 Jan. 1815. He entered the army, was soon appointed governor of Senegal and while in this office made many useful regulations. After his return he devoted himself to that light kind of literature which distinguished the age of Louis XV. His reputation gave him a seat in the States-General, where he was esteemed for his moderation and his good intentions. After 10 Aug. 1792 he left France and met with a friendly reception at Reinsberg from Prince Henry of Prussia, and Frederick William II. A large grant was made to him in Poland for establishing a colony of French emigrants. In 1800 he returned to Paris, where he devoted himself to literary pursuits which in 1804 procured him a seat in the French Institute. He lies buried near the Abbé Delille, and on his tomb is this inscription, written by himself and characteristic of his lively disposition: «Mes amis, croyez que je dors.» His works were published in 1815. Consult Uzanne, ‹Notice sur la vie de Boufflers› (Paris 1886).

BOUGAINVILLE, boo-găṅ-vēl, **Louis Antoine de,** French navigator: b. Paris, 11 Nov. 1729; d. there, 31 Aug. 1811. He abandoned law for military service; at 25 published a treatise on integral calculus; in 1754 went to London as secretary of the French embassy; in 1756 served in Canada as aide-de-camp to Montcalm against the British; was wounded at the capture of Ticonderoga in 1758; and during the siege of Quebec in 1759 commanded 1,500 troops at Cap Rouge. In 1763 he left the army with the rank of colonel and entered the navy. He undertook at government request to establish a colony in the Falkland Islands, but owing to Spanish objections, he sailed for the Straits of Magellan and from 1766 to 1769 circumnavigated the globe, making numerous important scientific and geographical discoveries. When the French took part in the American war of Independence, Bougainville was appointed commander of a ship of the line, and greatly distinguished himself in the battle between De Grasse and Admiral Rodney. He was promoted *chef d'escadre*; re-entering the army he was made *maréchal de camp*; he obtained the rank of vice-admiral in 1791; and in 1795 was elected an original member of the French Institute. Late in life Napoleon honored him with a senatorship, made him count of the empire and member of the Legion of Honor. His name is geographically perpetuated in different parts of the world and scientifically by the South American climbing plant Bougainvillea.

He was the author of ‹Voyage autour du monde› (2 vols., Paris 1771–72) and Parkman gives his Canadian journal high praise for its historical value.

BOUGAINVILLE ISLAND, an island in the Pacific Ocean, belonging to the Solomon group and under Australian mandate; situated in about lat. 6° S. and long. 155° E.; area 3,860 square miles. It is separated from Choiseul Island by Bougainville Strait. It is well wooded, densely populated and contains two active volcanoes, one of which, Mount Balbi, rises to a height of over 10,000 feet. The name Bougainville is also applied to a strait in the New Hebrides group between the island of Marina and Mallicolo, a cape on the northwest coast of Australia and a cape on the south coast of New Ireland. Pop. about 60,000.

BOUGAINVILLEA, a genus of woody, spiny vines of the family *Allioniaceæ,* consisting of a dozen species, natives of South America. Two of the species, *B. spectabilis* and *B. glabra,* are commonly cultivated in hothouses because of the beauty of the large red or purplish bracts which enclose the flowers and remain upon the plant for a long time. In California and Florida they are grown out-of-doors, as elsewhere in tropical America, and they are probably the most showy vines grown in those regions.

BOUGHT AND SOLD NOTES, written memoranda of a transaction, made by the broker in the case and delivered by him to his principals. They state respectively that the broker has bought for the vendee, and sold for the vendor, the subject of the transaction. When the broker has not exceeded his authority, both parties are bound thereby (4 Esp. 114; 2 Camp. 337). No particular form is required, but there are four kinds: (1) «Where the broker professes to act for both parties, whose names are disclosed in the note. (2) Where the broker does not disclose in the bought note the name of the vendor, nor in the sold note the name of the buyer, but still shows that he is acting as broker and not as principal. (3) Where the broker on the face of the note appears to be the principal. (4) Where he professes to sign as broker but is really the principal» (4 Am. & Eng. Enc. Law 751). The bought and sold notes, however, do not constitute the contract. They may, however, be accepted as evidence of the contract, and not the original contract, when so established by the usage of trade.

BOUGHTON, bâ'tŏn, **George Henry,** English painter: b. near Norwich, England, 1833; d. London, 19 Jan. 1905. His parents came to the United States in 1839 and settled in Albany. He studied art without a master and in 1856 made a sketching tour through England, Scotland and Wales. In 1860 he went to London and Paris to continue his studies. After 1862 he resided in London. His best pictures were ‹The Idyl of the Birds,› ‹Hay-Harvest in Brittany,› ‹The Scarlet Letter,› ‹Wayside Devotion,› ‹Puritans Going to Church,› ‹Snow in Spring› and ‹The Return of the Mayflower.› He became a member of the National Academy in 1871; associate of the Royal Academy, London, in 1879, and member of the Royal Academy in 1896. He also wrote for the magazines and illustrated his stories. Consult Baldry, A. L., ‹G. H. Boughton: His Life and Work› (London 1904).

BOUGHTON, Martha Arnold, American author: b. Corunna, Mich. She was graduated at the University of Michigan, 1880; taught in public schools and high schools at Saint Clair, Mich., and Detroit, 1880–84; was delegate to the World Congress of the Women's Christian Temperance Union, London, 1906. She published ‹Memoir of J. M. Arnold, D.D.› (1885); ‹The Quest of a Soul and Other Verse› (1911), and is a contributor to various publications.

BOUGHTON, Willis, American educator and lecturer: b. Victor, N. Y., 17 April 1854. He was graduated at the University of Michigan 1881, and later received degree of A.M. from Dickinson College 1891, and Ph.D. from Ohio University 1900, and from Columbia University a higher diploma. He was lecturer on English, University of Pennsylvania, 1891–92; professor of rhetoric and English literature, Ohio University, 1892–99; teacher of English, Erasmus Hall High School, Brooklyn, since 1899; lecturer for New York University (extramural), for the Brooklyn Institute of Arts and Sciences, for the Brooklyn Teachers' Association and for the Board of Education, New York; president of the department of philology, Brooklyn Institute, 1914. Editor Tennyson's ‹Idylls of the King› (1906); Irving's ‹Life of Goldsmith› (1903), and Milton's ‹Short Poems› (1909). Author of ‹Mythology in Art› (1890); ‹History of Ancient Peoples› (1896); ‹Chronicles of Erasmus Hall Academy› (1906); ‹History of English Literature in Outline› (1913); ‹Ode to Learning› (1912); joint editor of the *Journal of Pedagogy* (1890–92).

BOUGIE, boo-zhē', Algeria, a port on the Bay of Bougie, 120 miles east of Algiers. Bougie was the Saldæ of the Romans and in the 5th century was a chief seat of the Vandals. Under the Arabs it was raised to such importance that it was called Little Mecca and was the entrepôt of the trade between Christendom and North Africa, but after various vicissitudes it had sunk to a small village in 1833, when the French captured the place. Their extensive works have since rendered it a strong fortress and a commercial centre of some value. Pop. about 19,000.

BOUGIE (Fr. taper, also wax candle), in surgery, a smooth cylindrical rod, designed to widen the canals of the human body by its introduction therein or to apply medicaments to a particular part of the interior of the body. It is distinguished from a catheter by being solid, while the latter are hollow and open at the ends for the purpose of affording a passage for fluids. Bougies are generally pointed at one end and grow gradually thicker toward the other end, but in some cases they are of the same thickness throughout their whole length, the ends being only rounded off. They are made sometimes of linen dipped in wax and then rolled up, sometimes of a kind of plaster and linen, also of caoutchouc or gutta-percha, or of metal, such as lead, silver or German silver.

BOUGUER, boo-gā', **Pierre,** French scientist: b. Croisic, Brittany, 16 Feb. 1698; d. 15 Aug. 1758. He studied the elements of mathematics under his father, who was an able hydrographer and is well known as the author of an excellent ‹Treatise on Navigation.› In 1727 he gained a prize at the French Academy for the best essay on the masting of vessels. He gained similar prizes in 1729 and 1731, and added still more to his fame by a work entitled ‹Traité de la gradation de la lumière,› in which he endeavors to ascertain the quantity of light absorbed by transparent bodies, explains the construction of several ingenious instruments which he had invented for the purpose of facilitating such investigations, and maintains that the light of the sun is more intense at its centre than on the edges of its disc, while in the moon the reverse is the case. About this time the figure of the earth was the subject of frequent discussion in the Academy of Sciences, and for the purpose of ascertaining exactly how much it was elevated at the equator and flattened toward the poles, it was proposed to measure the length of a degree at each of these positions and at the same time make other observations and experiments of importance to astronomy and navigation. An expedition was accordingly fitted out, in which Bouguer was associated with Godin and La Condamine. The main burden of the task fell upon Bouguer, who published the results in a work entitled ‹Théorie de la figure de la terre.› A quarrel with La Condamine concerning the honors of the work embittered the latter part of his life and probably hastened his death.

BOUGUEREAU, boog-e-rō′, **Adolphe William,** French painter: b. La Rochelle, 30 Nov. 1825; d. Paris, 20 Aug. 1905. He was opposed in his desire to become an artist by his father, but through the assistance of a relative he was enabled to study, coming to Paris in 1845, where he entered the Ecole des Beaux-Arts, remaining there till 1850, when he divided the Grand Prix de Rome scholarship with Baudry and thereupon spent the customary four years in Italy, remaining until 1854. A comrade of Bouguereau's at this period has left us an account of the industry he displayed as a student. At the Salon of 1857 he received a first medal and was made a member of the Legion of Honor in 1856, officer in 1876, commander 1885 and grand officer in 1903. From 1856 on he won all the honors which the French government awards, as well as many others. A new generation has not dealt kindly with Bouguereau. His work has been severely criticized by the partisans of a new and fresher style of art. Of his paintings the best known are ‹The Martyr's Triumph›; ‹The Birth of Venus› (1879); ‹La Vierge Consolatrice› (1877) — all in the Luxembourg. The mural decorations in Sainte Clothilde and Saint Augustin, Paris, are from his hand, as also those in the Opera at Bordeaux. Consult Bavard, E., ‹William Bouguereau› (in *Monde Moderne,* 1897); Hamerton, ‹French Painters› (1885); Vendryes, ‹Catalogue illustré des œuvres de Bouguereau› (Paris 1885). His works are to be seen at the museums of Antwerp, ‹Portrait of the Artist›; Birmingham, ‹Charity›; Montreal, ‹The Crown of Flowers›; Amsterdam, ‹The Lamb›; and the Metropolitan Museum, New York, ‹Brother and Sister.›

BOUILHET, boo-ē-yā, **Louis Hyacinthe,** French poet: b. Cany, 27 May 1822; d. Rouen, 19 July 1869. He first achieved fame with ‹Melœnis,› a poem in five cantos. It deals with Roman manners in the days of the Emperor Commodus. ‹The Fossils,› a series of delineations of antediluvians, attracted attention on account of the attempt which the author makes in it to use a scientific topic as a subject for poetry. His versified dramas, ‹Mme. de Montarcy› (1856); ‹Dolorès› (1862), and especially ‹The Conspiracy of Amboise,› are elegant in style, rich in imagery, perfect in melody, but lack compactness of structure and are open to moral censure. The same faults are found in his comedies, ‹Uncle Million› (1861); ‹Faustine› (1864), and his posthumous ‹M'lle Aïssé.›

BOUILLÉ, François Claude Amour (Marquis de), French soldier: b. Cluzel Castle, Auvergne, 19 Nov. 1739; d. London, 14 Nov. 1800. He distinguished himself in the Seven Years' War; was appointed governor of Guadaloupe in 1768, and conquered Dominica, Saint Eustatia, Tobago, Saint Christopher, Nevis and Montserrat. After the Peace of 1783 he returned to Paris and was appointed lieutenant-general. He afterward traveled in England, through Holland and a great part of Germany, until he was made chief of the province Trois-Evêchés, now named Verdun, Metz and Toul. In the Assembly of Notables (1787–88) he declared for the proposed reforms of Calonne, which, however, were defeated by Cardinal Brienne. He was opposed to the plan of Necker for the union of the provinces. At the breaking out of the Revolution he supported the existing government, both in his former province and in Lorraine, Alsace and Franche-Comté. It was only at the urgent desire of the King that he swore allegiance to the constitution of 1791. He repressed in 1790 the rebellion of the garrisons of Metz and Nancy; and although the National Assembly decreed him a vote of thanks for the bravery and ability he had displayed on this occasion, still the revolutionists distrusted him. Shortly afterward he made preparations to assist Louis XVI in his escape. Bouillé had made his arrangements well, and had not the King forbidden any bloodshed he certainly would have rescued him. Being thus compelled to leave the King at Varennes to his fate, he fled from the dangers to which he himself was exposed by the attacks of the revolutionists. From Luxembourg he wrote a threatening letter to the National Assembly, and then exerted himself to excite the foreign powers against the republic. He succeeded well at Vienna, gained over Gustavus III, and obtained the promise of 30,000 men from the Empress Catherine II, to be put under the command of the King of Sweden and the French general. But Gustavus was murdered, the Empress forgot her promises and Bouillé went over to England in 1796. Here he wrote his ‹Memoirs of the Revolution,› which appeared in an English translation (London 1797), and, after his death, in the original. Consult Gabriel, ‹Louis XVI, le Marquis de Bouillé et Varennes› (Paris 1874).

BOUILLIER, boo′yā, **Francisque,** French philosopher: b. Lyons 1813; d. there 1899. A student at the Normal School, Paris, he was appointed professor of philosophy in the University of Lyons 1839; was dean of the faculty from 1849 to 1864, and director of the Normal

School 1867 to 1870. His principal works, distinguished by sound scholarship and perfect style, are ‘Histoire et critique de la révolution cartésienne’ (1842); ‘Théorie de la raison impersonnelle’ (1844); ‘Le principe vital et l'âme pensante’ (2d ed., 1873); ‘La vraie conscience’ (1882); ‘Du plaisir et de la douleur’ (4th ed., 1891). Consult his autobiographical, ‘Souvenirs d'un vieil universitaire’ (1897); Latreille, ‘Francisque Bouillier, le dernier des Cartésiens’ (Paris 1907).

BOUILLON, boo-ē-yŏṅ, the name of one of the most distinguished historical families of France. The last Duke of Bouillon of the first line, the famous Godfrey of Bouillon, had sold the duchy to the bishop of Liége, but a new line arose toward the end of the 15th century. It originated with a cadet of the house of Marck, which, at the commencement of the 15th century, possessed the principality of Sedan. In 1842 William de la Marck, well-known as «The Boar of Ardennes,» seized the territory of Bouillon, belonging to the bishopric of Liége, and conferred it on his brother Robert. The bishop of Liége attempted by force to regain it, but this Robert, and a son of the same name who succeeded him, were successful in resisting; and at the end of the war, which was brought to a close in 1492 by the mediation of the King of France, Robert the younger remained virtually, if not formally, Lord of Bouillon. The 3d Robert succeeded his father last mentioned; and having, like his predecessors, entered the service of France, was made prisoner with Francis I at the battle of Pavia. He afterward obtained a marshal's baton, and under the name of Maréchal de Fleuranges, which was the title he assumed, is known as the author of very curious memoirs. Robert IV, son of Robert III, appears to have been temporarily dispossessed by the bishop of Liége, but recovered possession, and not only became marshal of France, but received the title of duke, and thus became the 1st Duke of Bouillon of the new line. He was taken by the Spaniards at the siege of Hesdin in 1553; and three years after, when he had been liberated on parole for the purpose of procuring the 60,000 crowns at which his ransom had been fixed, died by poison. His wife was a daughter of the celebrated Diana of Poitiers. His son, Henry Robert, lost Bouillon, which, by the Treaty of Château-Cambray, returned to the bishop of Liége, but he still preserved the title, and transmitted it to his son William Robert, who died in 1588 without having married. The male line thus became extinct. He was survived by a sister, who married Henri de la Tour d'Auvergne, Viscount Turenne, but died without children in 1594. She had, however, bequeathed her possessions to her husband, and thus the two powerful houses of Turenne and Bouillon were merged into one. This new Duke of Bouillon was one of the most distinguished personages of his time. He was at first devotedly attached to Henry IV while he was fighting his way to the throne, but afterward leagued with his enemies; and, being implicated in the conspiracy which cost Marshal Biron his life, was long obliged to live in exile. He was restored to favor in 1606, and figured much during the intrigues in the subsequent part of the following reign and, having embraced the doctrines of the Reformed Church, became one of its most distinguished leaders. He died in 1623, leaving two sons, the younger of whom was the celebrated Marshal Turenne. The elder, named Frédéric Maurice, after serving with distinction in the Low Countries, returned to France, became a Roman Catholic, served Louis XIII, then joined the insurrection against him headed by the Count of Soissons, and helped him to gain the battle of Murfée. During the Fronde he joined the princes and took a prominent part in the civil war, but was reconciled to the court in 1651, obtained the title of prince, and received large accessions of territory in exchange for the principality of Sedan. He died in 1652, leaving interesting memoirs of his life and times. He was succeeded by Godefroi Maurice, who figured much in the wars of the period and became great chamberlain to Louis XIV, and who died in 1721. One of his brothers was the celebrated Cardinal de Bouillon, who was born in 1644, obtained the cardinalate when only 26 years of age, was long the representative of the Gallican Church at Rome, made himself notorious by his vanity, ambition and intriguing spirit, and died in 1715. Consult Marsollier, ‘Life of Henry, Duke of Bouillon’ (3 vols., Paris 1726); Ozerây, ‘Histoire de Bouillon’ (Luxembourg 1827).

BOUILLON, originally a German duchy, now a large district in the province of Luxembourg, Belgium, 9 miles wide and 18 long, on the borders of Luxembourg and Liége. This woody and mountainous tract consists of the town of Bouillon with 2,800 inhabitants, and 25 villages with 20,000 inhabitants. The town was once the capital of the duchy of the same name. This ancient place lies in the midst of hills, on the left bank of the Semois, which abounds with fish, 40 miles from Liége and 8 from Sedan. It has a strong castle upon a rock, which, however, is commanded by the neighboring mountains. Godfrey of Bouillon once possessed the dukedom of this name. He was Duke of Lower Lorraine, and Bouillon was bestowed upon him as belonging properly to the county of Ardenne. In order to supply himself with funds for his expedition to the Holy Land, Godfrey mortgaged his duchy of Bouillon in 1095 to the bishop of Liége. After the estate had been held for many years by the bishopric, the houses of la Marck and La Tour d'Auvergne laid claims to Bouillon, but in 1641 relinquished their pretensions to the bishop of Liége for 150,000 Brabant guilders. In the war of 1672 France conquered Bouillon, and Louis XIV gave it in 1678 to the Chevalier La Tour d'Auvergne, his chamberlain. After this time it belonged to the house of La Tour until the Revolution, when it was taken from them in 1792. The last possessor, Godfrey Charles Henri de la Tour d'Auvergne, died December 1812. By the Peace of Paris, in 1814, the dukedom was included in that of Luxembourg, which had fallen to the King of the Netherlands. The title of Prince of Bouillon was assumed in 1792 by Philip d'Auvergne, captain in the British navy, and he continued to bear it till his death in 1816. The congress which met at Vienna in 1815 appointed commissioners to investigate the comparative claims of this nobleman and Prince Charles of Rohan. They decided in favor of the latter. By him it was sold to the Netherlands in 1821, and on the division of the kingdom at the revolution of 1830 it fell to Belgium. Consult Ozerây, ‘Histoire de Bouillon’ (Luxembourg 1827).

BOUILLY, boo-ē-yē′, **Jean Nicolás,** French dramatist: b. Coudraye, 4 Jan. 1763; d. Paris, 14 April 1842. He made his début with the comic opera ‘Pierre le Grand’ in 1790 for which Grétry wrote the music. During the Revolutionary Period he was judge and prosecuting attorney at Tours, and then was called to Paris to assist in organizing the primary school system. He retired from public life in 1799. He was a man of ancient Roman virtue, and his character is reflected in all his works. His comedies and comic operas (music by the first masters) were eminently successful as well in Germany as in France, particularly, ‘L'abbé de l'epée,’ ‘Les deux journées,’ ‘Mme. de Sévigné.’ He also wrote ‘Conseils à ma fille’ (1809); ‘Contes offerts aux enfants de France’ (1824); ‘Les adieux du vieux conteur’ (1835); and ‘Contes à ma fille’ (1835).

BOULAINVILLIERS, boo-lăṅ-vē-yā, **Henri de** (Comte de), French historian: b. Saint Saire, Normandy, 11 Oct. 1658; d. 23 Jan. 1722. He studied at the College of Juilli, entered the army, but shortly after became devoted to historical and antiquarian pursuits. He wrote a number of works in connection with the history of France, but is perhaps best known by his ‘History of Mohammed,’ in which he writes in a very Oriental style, lauds the Prophet and seems almost disposed to become a believer in the Koran. He is said to have been much addicted to astrology. He wrote ‘Histoire de l'ancien gouvernement de France’; ‘Histoire des Arabes,’ etc.

BOULANGER, boo-lŏṅ-zhā, **Georges Ernest Jean Marie,** French soldier: b. Rennes, 29 April 1837; d. Brussels, 30 Sept. 1891. He went to Algeria in 1853, where his coolness under fire was very noticeable. In 1859 he was severely wounded at the battle of Turbigo, and was awarded the cross of the Legion of Honor. In the war with Prussia he distinguished himself at both sieges of Paris. He was sent to the United States in 1881 as head of the French delegation sent to offer congratulations on the centenary of Yorktown. As director of infantry (1882) he effected some salutary reforms. Appointed a general of division in Tunis in 1884, his resignation was precipitated by a conflict with the civil authority. In 1886 he became Minister of War in Freycinet's Cabinet, and the fact that a new man was in possession of that portfolio was speedily felt. He introduced many needful reforms, insisted on the adoption of a repeating rifle, caused important experiments to be made with high explosives, reduced the period of service in the army from five to three years and became the hope of the disaffected elements and the promoters of the policy of *la revanche.* In the ministerial crisis of 1887 he lost his portfolio and was appointed to the command of the 13th army corps, but as he had become a menace to the republic, he was retired, 28 March 1888. In January 1889 he was elected deputy to the National Assembly by 81,000 majority, in consequence of which the Floquet ministry resigned. In August 1889 he was charged with embezzlement, treason and conspiracy, and found guilty by the Senate; the elections in the 12 cantons were annulled, and he was sentenced to deportation. He had been the tool of Royalists, Bonapartists and extreme radicals, the sinews of war for his propaganda being provided — as revealed in the Paris *Figaro* — by the Royalists. He committed suicide by shooting himself on the grave of Mme. de Bonnemainè, his mistress.

BOULANGER, Gustave Clarence Rodolphe, French artist: b. Paris 1824: d. there 1888. A pupil of Jollivet and Delaroche, he won the Prix de Rome in 1849 and profited by the three years' course of study and travel in Italy. His art was devoted to classical and Oriental subjects, he won several medals and was elected a member of the Institute in 1882. His best known work owing to its public display is the series of 20 panel portraits of dancers decorating the foyer of the New Opera, Paris. His paintings distinguished by excellent taste and imaginative power include ‘Cæsar at the Rubicon’ (1865); ‘Promenade in the Street of Tombs, Pompeii’ (1869); ‘Slave Market’ (1888).

BOULANGER, Louis, French painter: b. Verciel, Piedmont, 11 May 1806; d. Dijon, 5 March 1867. He studied under Guillon-Lethière and Devérias; became intimate with Victor Hugo and illustrated many of his works; also taking subjects for many of his paintings from the poems of Hugo and Chateaubriand. Among his paintings are ‘Mazeppa,’ ‘The Spanish Mule Drivers,’ ‘The Triumph of Petrarch’ and ‘Macbeth.’

BOULAY DE LA MEURTHE, boo-lä-ē dė lä mėrt, **Antoine Jacques Claude Joseph** (Count), French lawyer and politician: b. Chamousey, Lorraine, 19 Feb. 1761; d. Paris, 2 Feb. 1840. During the Revolution he served as a volunteer in the army, and as a judge on the bench, until the Reign of Terror, when he was outlawed. After the 9th Thermidor he was appointed presiding judge of the Civil Court, and afterward held the office of attorney-general at Nancy. He sat in the Council of Five Hundred, was active in the *coup d'état* of the 18th Fructidor and aided in the revolution of the 18th Brumaire. Being appointed chairman of the legislative section in the Council of State, he took an active part in digesting the Code Civil. On the first restoration he kept aloof from public affairs; during the Hundred Days he was again a minister of state; on the abdication of Napoleon I he caused the latter's son to be proclaimed as Napoleon II, and was appointed Minister of Justice by the commission of government. He was, of course, outlawed by the returning king, and for four and a half years was an exile. In 1819 he was permitted to return to France.

BOULAY DE LA MEURTHE, Henri George, Count, son of the preceding, French statesman: b. Nancy, 15 July 1797; d. 1858. He took an active part in the revolution of 1830. In 1837 he was elected to the Chamber of Deputies. In 1843 he voted for the repeal of the decree of banishment against the Bonaparte family. In February 1848 he sided with the moderate Republicans, was elected to the Constituent Assembly, and there again supported the motion for the return of the Bonaparte family. When Louis Napoleon was elected President the name of Boulay de la Meurthe was placed by him at the head of the list of candidates for the vice-presidency; and the assembly almost unanimously chose him. After the *coup d'état* of 1851 he was made a member of the Senate.

BOULDER, Col., city and county-seat of Boulder County, situated on Boulder Creek, and on the Union Pacific and other railroads, 30 miles north of Denver. It was settled in 1858 and received a city charter in 1871; is the seat of the State University; and has three national banks, a Carnegie library, a business college, daily and weekly periodicals, and a property valuation of over $1,000,000. The famous Boulder Cañon is an object of wide interest to the tourist. Boulder is noted as a summer and health resort, medicinal springs being near, and a sanatorium in the city. It is an agricultural stock raising and mining region, and has flour mills, sampling works, lumber mills, cutlery and food product factories, and manufactories of clay and kaolin products. A large number of oil wells have been drilled within a radius of two miles of the city. The government is vested in a mayor, chosen for two years, and a city council. The waterworks are the property of the city. Pop. 10,000.

BOULDER, a rounded water-worn stone of some size; in geology, applied to ice-worn and partially smoothed blocks of large size lying on the surface of the soil, or embedded in clays and gravels, generally differing in composition from the rocks in their vicinity, a fact which proves that they must have been transported from a distance, probably by ice. When lying on the surface they are known as «erratic blocks.»

BOULDER CLAY. See TILL.

BOULEVARD, bool-vär (O. Fr. *boulevart,* a word derived from the German *bollwerk,* the same as the English «bulwark»). The word was formerly applied to the ramparts of a fortified town, but when these were leveled, and the ditches belonging to them filled up, and the whole planted with trees and laid out as promenades, the name «boulevard» was still retained, and thus came to have its present signification. The most famous boulevards are those of Paris, especially those which, in the time of Louis XIV, took the place of the fortifications on the northern side of the city, and became first a promenade and then a street. Modern usage has applied the word to many streets which were not originally ramparts, but which have been cut through the older and denser parts of the town, or have been laid out in the new quarters. All that the more modern boulevards have in common with the older ones in that they are broad and are planted with trees. The modern boulevards are for the most part situated at some distance from the bustle of the town, and are therefore less frequented than the older ones, which are in the very heart of the city, and in the neighborhood of the chief resorts of amusement and pleasure. In the United States the name is applied to wide avenues planted with shade-trees, and with more or less ornament in the way of statuary, flower-beds, lawns, etc. The Thames Embankment, in London, though not usually called a boulevard, is of this order. See CITY PLANNING; PARIS.

BOULGER, Demetrius Charles, English writer: b. 14 July 1853. He is an authority on military topics and with Sir Lepel Griffin founded the *Asiatic Quarterly Review* in 1885 and edited it for nearly five years. He has published ‹England and Russia in Central Asia›; ‹Central Asian Portraits›; ‹The History of China›; ‹Central Asian Questions›; ‹Life of Sir Stamford Raffles› (1897); ‹The Congo State› (1898); ‹India in the 19th Century› (1901); ‹Life of Sir Halliday Macartney› (1908); ‹Holland of the Dutch› (1913); England's Arch-Enemy› (1914); and five books on Belgium and the Belgians.

BOULGER, George Simonds, English botanist: b. Blechingley, Surrey, 5 March 1853. He has been professor of botany and geology at City of London College from 1884 and has published ‹Familiar Trees› (1886–89); ‹The Uses of Plants› (1889); ‹Biographical Index of British and Irish Botanists,› with Britten (1893); ‹The Country, Month by Month,› with Owen (1894–95); ‹Elementary Geology› (1896); ‹Flowers of the Field› (1900); ‹Wood› (1902); ‹Botany› (1912); ‹Plant Geography› (1912); ‹British Flowering Plants› with Mrs. Henry Perrin (4 vols., 1914).

BOULOGNE-SUR-MER, boo-lōṅ sür mãr, France, a fortified seaport of northern France, 22 miles southwest of Calais, at the mouth and on the right bank of the river Liane, with the suburb of Capécure on the left. The town proper consists of an upper and lower town. The former is surrounded with old and well-planted ramparts, now fashionable boulevards; the latter, which is the business section, has straight and well-built streets and is semi-English in character, many of the signboards being in English, the shops having an English air, and much English being spoken. The church of Notre Dame (begun in 1827, consecrated in 1866) has a magnificent high altar, and a crypt, part of which dates from the 12th century. Among the churches, some of which are handsome edifices, there are several for the English population. The castle, which dates from 1231, is a massive structure, communicating with the upper town by a bridge. Here Louis Napoleon was imprisoned in 1840 after his attempted resurrection. Other noteworthy buildings are the Hotel de Ville, the Palais de Justice, the large and handsome bathing establishment, the exclusive public library, the museum of natural history and antiquities, etc. Boulogne carries on various industries, is one of the chief French seaports and is a great fishing centre. There is a large passenger traffic between Boulogne and Folkestone. Boulogne still exhibits some Roman remains. The Northmen took it in 882 and massacred the inhabitants. In 1544 the town was taken by Henry VIII of England after a siege of six weeks. The English retained it till 1550, when Edward VI sold it to France for 400,000 crowns. The Emperor Charles V demolished it in 1553. During the first republic Boulogne received the name of Port de l'Union. Bonaparte, with a view to the invasion of England, ordered the harbor to be made deeper, and a number of vessels to be built in order to transport his army. A large army was encamped here for many months waiting to embark; but upon the breaking out of hostilities with Austria in 1805 they were called elsewhere. Pop. 53,128.

BOULOGNE-SUR-SEINE, sān, France, town in the department of the Seine, southwest of Paris, of which it is a suburb. Saint-Cloud is on the opposite bank of the Seine and is connected with it by a stone bridge. It contains linen bleacheries and manufactures perfumes. The famed amusement and playground centre of Paris, the Bois de Boulogne, is named after Boulogne-sur-Seine. The place was formerly known as Menus-les-Saint-Cloud. Pop. 57,027.

BOULTON, Charles Arkoll, Canadian soldier and statesman: b. Cobourg 1841; d. 1899. He entered the British army in 1858 and served for 10 years. During the first Manitoba insurrection in 1870 he fought against the rebels and was captured and condemned to death; when the second rebellion broke out in 1885 he commanded a corps organized by himself and known as Boulton's Scouts. He became a member of the Canadian Senate in 1889. He wrote ‹Reminiscences of the Northwest Rebellion.›

BOULTON, Matthew, English engineer: b. Birmingham, 3 Sept. 1728; d. Soho, 18 Aug. 1809. After being educated at a grammar school he was instructed in drawing by Worlidge, and he also studied mathematics. He engaged in business as a manufacturer of hardware, and as early as 1745 he is said to have invented and brought to great perfection inlaid steel buckles, buttons, watch-chains, etc., of which large quantities were exported to France, whence they were repurchased with avidity by the British as «the offspring of French ingenuity.» In 1762 Boulton, finding his manufactory at Birmingham too confined for his purposes, purchased a lease of the Soho, about two miles distant, in the county of Stafford. This spot, then a barren heath, was gradually converted into an extensive manufactory and school of the mechanical arts, where ingenious men found ample employment for their talents from the liberal patronage of the proprietor. The completion of the steam-engine, at Soho, led to a connection between Boulton and James Watt, of Glasgow, who became partners in trade in 1769. The introduction of the steam engine at that time was entirely due to the enterprise of Boulton, who almost reduced himself to bankruptcy during the 15 years of strenuous devotion before the machine became a commercial success. (See WATT, JAMES). Consult Smiles' ‹Lives of Boulton and Watt› (London 1865).

BOUNCING BET, or OLD MAID'S PINK, an old-time garden flower common as a weed. See SOAP-PLANTS.

BOUND BROOK, N. J., borough of Somerset County, situated on the Raritan River and on the Baltimore & O., and Central N. J., the Lehigh Valley and the Philadelphia & Reading railroads. It has a large lumber trade, and manufactures woolen goods, electric dynamos, paint, roofing-paper, motion-picture films, asbestos products, stove polish, etc. During the Revolutionary War it was the scene of a surprise of the American troops by Cornwallis. The Americans, being largely outnumbered, were forced to retreat after a short battle. There is a public library. Bound Brook was first settled in 1700, but was not incorporated until 1892. It is governed by a mayor, chosen for two years, and a council. Pop. (1920) 5,906.

BOUNDARIES OF THE UNITED STATES, Exterior and Interior, and Disputes Regarding. As laid down by the United States Supreme Court in the insular decisions of 1901 (see INSULAR CASES), the term United States has three applications, (1) to the combined area of the States of the Union; (2) to the combined area of the States and the Territories which Congress has incorporated into the Union; and (3) to the combined area of the States, Territories and dependencies. Hence, under the last interpretation, the United States includes not only the continental States in the middle of North America, but also Alaska, the Canal Zone and the islands in the Atlantic and Pacific oceans.

Sea Boundaries.— International law generally concedes that a country's jurisdiction extends out to sea three nautical miles from low-water mark and this applies also to that country's dependencies. (See INTERNATIONAL LAW; HIGH SEAS; MARE CLAUSUM). There may be some exceptions to this rule, however, as in the case of a bay more than six miles wide. Thus the waters of Delaware and Chesapeake bays, as first clearly stated in 1793 and never since disputed, are included in the jurisdiction of this country, though their mouths are more than six miles wide. Long Island Sound is nowhere more than three miles wide between islands and therefore United States jurisdiction over it has not been disputed. Until 1893 the United States claimed that the eastern part of Bering Sea was a closed sea under the boundary limits described in the Russian treaty of 1867, and therefore that foreign vessels might be seized either within or without the three-mile limit. But the arbitration tribunal in its decision of 15 Aug. 1893 ruled against the United States. See BERING SEA CONTROVERSY.

Lake and River Boundaries.— Lakes wholly enclosed by the territory of the United States come entirely within its jurisdiction, but lakes and rivers constituting a part of the boundary line between the United States and foreign countries come under the joint jurisdiction of both parties, and the entire breadth of the dividing waters is available for navigation by the citizens or subjects of both powers. Citizens of the United States have the right to use the Saint Lawrence below the boundary and its canals substantially on the same terms as Canadians. On 4 Sept. 1890, Congress passed an act under the terms of which the Federal courts have criminal jurisdiction over the Great Lakes and connecting waters as far as the middle boundary line, and the States may legislate regarding the fisheries within these limits. Most of these river and lake boundaries have been laid down by a series of conventions and findings of commissioners appointed to determine such matters. Thus Isle Royale in Lake Superior belongs to the United States and Point-au-Pelee Island in Lake Erie belongs to Canada, but in the main the dividing line is in the middle of the Saint Lawrence River and the Great Lakes. A similar division has been made of the islands lying in the Rio Grande River and in that part of the Colorado River which forms the international boundary. On 9 Dec. 1850, an agreement was reached by the American Minister at London and the British Foreign Secretary to readjust the Canadian water boundary, the rocky area at the entrance of Niagara River, known as Horseshoe Reef, being ceded to the United States as a site for a lighthouse.

Island Boundaries.— The United States possesses numerous islands, large and small, in both the Atlantic and Pacific oceans (see the general descriptive article UNITED STATES), and the exterior boundaries of all extend three nautical miles out to sea from low-water mark. The ownership of the San Juan Islands in Puget Sound was in dispute for 25 years, but in 1872 the Emperor of Germany, as arbitrator, awarded the group to the United States. Associated with this controversy were the claim of the United States that the line of the 49th parallel in Puget Sound terminated half way between Point Roberts on the west side of Boundary Bay and the western coast and the British claim that the line terminated half way between the point where it first struck tide water and the British coast on the west. The contention of the United States was upheld. The Philippine Islands were taken from Spain after the war of 1898. In the treaty of peace terminating the war all islands within a series of geographical lines described by the treaty were transferred to the United States, but this did not confer jurisdiction outside the three-mile limit. Later a small group of islands to the south was found to be cut off by this line and in 1901 Spain ceded any of the Philippine group lying outside the prescribed geographical lines, particularly Cagayan, Sulu and Sibutu. Tutuila, one of the Samoan Islands, was annexed in 1899; by the treaty of 2 Dec. 1899 with Great Britain and Germany the 171st meridian west of Greenwich was constituted the dividing line between the territory of the United States on the eastward and of Great Britain and Germany on the westward, but this treaty did not extend jurisdiction beyond the three-mile limit.

Panama Canal Zone.— Under Article II of the treaty of 18 Nov. 1903, Panama granted to the United States «in perpetuity the use, occupation and control of a zone of land and land under water . . . extending to the distance of five miles on each side of the centre line of the route of the canal» and three marine miles out to sea from mean low-water mark at each end, not including the cities and harbors of Panama and Colon; but other lands outside the zone necessary for canal purposes are to be used, occupied and controlled in perpetuity. Panama also granted «in perpetuity the use, occupation and control of all islands within the limits of the zone above described, and in addition thereto the group of small islands in the Bay of Panama named Perico, Nacs, Culebra and Flamingo.» See CANALS.

Alaska Land Boundary.— On 28 Feb. 1825, Russia and Great Britain concluded a treaty which described the boundary of Alaska from the Arctic Ocean to the Pacific Ocean, and when Russia sold Alaska to the United States 30 March 1867, the treaty of cession quoted the boundaries as given in the Anglo-Russian treaty. This treaty practically excluded the British from possession of an unbroken strip of coast lands and waters of Alaska from Mount Saint Elias to Portland Canal. Comparatively little was heard of the boundary line until the discovery of gold in the Klondike. As given in the treaty the line was the 141st degree west from Greenwich as far south as a mythical mountain range along which the line ran parallel with the coast to the southern point of Prince of Wales Island, or about 50° 40′. Under the conventions of 22 July 1892, 3 Feb. 1894 and 20 Oct. 1899, commissioners were appointed to determine the line but they could not agree, and finally terminated negotiations. In 1898 Canada claimed the ports of Dyea and Skagway on Lynn Canal under the novel plea that a line defined as running 10 leagues parallel with the sinuosities of the coast or heads of tide-water inlets should run parallel to the coast itself. Canada contended that the eastern line left the heads of several inlets within Canadian territory, whereupon a controversy arose which was adjusted 29 Oct. 1899, when the United States fixed a provisional line about the head of Lynn Canal, thus giving Canada temporary possession of the places claimed to be within American jurisdiction. In July 1900, this was marked by a joint survey. On 20 Oct. 1903, the Alaska Boundary Commission rendered a decision which practically sustained the American claim, but the British contention with regard to Portland Canal was upheld and the small Wales and Pearse Islands at its head were awarded to Canada. On 21 April 1906, a convention was signed providing for a commission to run the meridian line on the 141st degree west. See ALASKA BOUNDARY COMMISSION.

Boundaries of the Original Possessions. — The date on which the United States may properly be said first to have had national boundaries is 4 July 1776, when the 13 original colonies declared their independence of Great Britain and formed a union. When this act was consummated the area of the colonies extended along the seacoast from the eastern boundary of Maine (then part of Massachusetts) to the southern boundary of Georgia; and thence inland so far as these communities extended. Under the proclamation line of 1763 the divide of the Appalachians was supposed to constitute the western limits, but the United States contended that the Mississippi River rightfully was the western boundary, this claim being recognized in the Treaty of Paris (1783) terminating the Revolution which defined the boundaries as follows:

> "The following are and shall be their boundaries, viz., from the northwest angle of Nova Scotia, viz., that angle which is formed by a line drawn due north from the source of the St. Croix River to the high lands which divide those rivers that empty themselves into the River St. Law-

rence, from those which fall into the Atlantic Ocean to the north-westernmost head of Connecticut River; thence drawn along the middle of that river to the forty-fifth degree of north latitude; from thence by a line due west on said latitude, until it strikes the River Iroquois or Cataraguy; thence along the middle of said river into Lake Ontario; through the middle of said lake, until it strikes the communication by water between that lake and Lake Erie; thence along the middle of said communication into Lake Erie; through the middle of said lake until it arrives at the water communication between that lake and Lake Huron; thence through the middle of said lake, to the water communication between that lake and Lake Superior; thence through Lake Superior northward to the isles Royal and Philipeaux to the Long Lake; thence through the middle of said Long Lake, and the water communication between it and the Lake of the Woods, to the said Lake of the Woods; thence through the said lake to the north-westernmost point thereof, and from thence a due west course to the River Mississippi; thence by a line to be drawn along the middle of the said River Mississippi, until it shall intersect the northernmost part of the thirty-first degree of north latitude; south, by a line to be drawn due east from the determination of the line last mentioned, in the latitude of thirty-one degrees north of the equator, to the middle of the River Apalachicola or Catahouchee; thence along the middle thereof, to its junction with the Flint River; thence straight to the head of St. Mary's River and thence down the middle of St. Mary's River to the Atlantic Ocean; east, by a line to be drawn along the middle of the St. Croix from its mouth in the Bay of Fundy to its source, and from its source directly north to the aforesaid highlands, which divide the rivers that fall into the Atlantic Ocean from those which fall into the River St. Lawrence, comprehending all islands within twenty leagues of any part of the shores of the United States, and lying between lines to be drawn due east from the points where the aforesaid boundaries between Nova Scotia on the one part, and East Florida on the other, shall respectively touch the Bay of Fundy and the Atlantic Ocean, excepting such islands as now are or heretofore have been within the limits of the said province of Nova Scotia."

Northeastern Boundary.— The northeastern boundary controversy lasted 59 years (1783–1842). The chief cause of trouble was the looseness with which the boundary was described. Under the Jay treaty concluded in 1794 a joint commission was appointed to settle the first part of the boundary on the northeast, the most vexatious question being the identity of the Saint Croix River. On 25 Oct. 1798, the river was identified and a monument placed at its source but the exact location of the «northwest point of Nova Scotia» could not be agreed upon nor the situation of the «high lands» mentioned in the treaty. After several years of wrangling Rufus King concluded the convention of 1803, under which a joint commission was appointed to ascertain the northwest angle of Nova Scotia, to run a line from the monument at the source of the Saint Croix to this northwest angle; also to determine the northwesternmost head of the Connecticut River, and to run a line from it to the corner of Nova Scotia. Unfortunately, however, Jefferson's purchase of Louisiana in 1803 complicated matters and the commissioners accomplished nothing. Article V of the treaty of Ghent (q.v.), concluded in 1814, provided for the appointment of two commissioners to settle the dispute, and in 1817 the work of surveying began. The surveyors traced a meridian from the source of the Saint Croix to a high elevation at Mars Hill, thence into the valley of the Saint John River, then to the summit of a ridge parting the waters flowing into the Saint John and those reaching the Restigouche, and 143 miles from the point of beginning met a ridge on the northern slope of which are the headwaters of the river Metis which enters the Saint Lawrence. The Americans claimed that the point at which the meridian crossed the crest of this ridge was the northwest angle of Nova Scotia, but the British agent contended that this ridge was a mere watershed and could not be accepted as the highlands designated in the treaty. As they could not agree on any of the disputed points the surveyors adjourned in November 1821, after presenting their divergent reports.

Seven years later the dispute was referred to the King of the Netherlands as arbitrator. In his decision of 10 Jan. 1831, he drew a line due north from the source of the Saint Croix to the middle of the Saint John, up that river and the Saint Francis to the source of its most southwesternmost branch, and then cut the disputed territory in half, awarding the northern part to Great Britain and the southern to the United States. This award aroused great indignation in Maine, whose legislature on 28 Feb. 1831 refused to submit to the decision. Massachusetts too was an interested party, and on 15 Feb. 1832, her legislature resolved that any act purporting to deprive a State of any territory was null and void and not obligatory upon the government or people of the State. Meanwhile Great Britain agreed, if necessary, to modify the line in any manner agreeable to the two governments. For many months propositions were bandied back and forth without any appreciable result and finally the Massachusetts legislature called upon the President to hasten the settlement. Shortly afterward Congress appropriated $20,000 to survey and mark a line due north from the source of the Saint Croix River.

At this stage of the controversy the negotiations were almost upset by the so-called Aroostook War. The Aroostook country was in the most northerly part of Maine and along the Aroostook River Great Britain had no jurisdiction. Every year land agents of Maine and Massachusetts would sell timber in this region, grant permits to cut down trees and expel trespassers. In 1838, however, the trespassers refused to depart and a force of 150 men under a land agent, Rufus McIntyre, was sent to the mouth of the Aroostook where 300 armed trespassers were found prepared to resist, but they retreated toward New Brunswick and later McIntyre was arrested. On 13 Feb. 1839, Lieut.-Gov. John Harvey of New Brunswick denounced the presence of the Maine troops as an invasion of British territory, demanded their removal and ordered the militia to be ready for action. Gov. John Fairfield of Maine refused, and instead hurried reinforcements to the scene of conflict, the legislature appropriating $800,000 for the military defense of the State. Congress upheld Maine by authorizing the enlistment of 50,000 volunteers to repel invasion and appropriating $10,000,000 for that purpose. But on 27 Feb. 1839, Secretary of State Forsyth and the British Minister, H. S. Fox, agreed to arbitrate the dispute, and Gen. Winfield Scott was ordered to Augusta. On his arrival he proposed to Harvey that, if he would not attempt the military occupation of the disputed territory or seek to expel the Maine troops, Fairfield would not disturb New Brunswick in her possession of the settlements on the Madawaska River or seek to dislodge the British by force of arms. Both governors assented to this proposition, the troops were sent home and war was averted. This hastened the final adjustment.

In the spring of 1842 Lord Ashburton was sent to negotiate, but before his arrival Secretary Webster obtained Maine's consent to a conventional line in return for certain concessions. Webster had been placed in possession of a letter written by Benjamin Franklin to Vergennes 6 Dec. 1782, and a map on which Franklin had marked «with a strong red line the limits of the United States as settled by the preliminaries between the British and the American plenipotentiaries.» As regards the Maine boundary the line almost exactly conformed to the British contentions, and if the map were authentic, Maine's claim was groundless. Accordingly Webster used this to compel Maine to modify her demands and to accept a conventional line, but in the subsequent negotiations with Ashburton he kept secret the existence of such a map. On 9 Aug. 1842, the Webster-Ashburton treaty was signed; as a result of which Maine was forced to accept 893 square miles less territory than the King of the Netherlands had awarded her. As stated in the treaty this line was exceedingly complex but in brief was as follows: From the monument at the source of the Saint Croix the line runs north to the Saint John River, up the middle of this river to the mouth of the Saint Francis, and up the middle of this river and of the lakes through which it flows to the outlet of Lake Pohenagamook; thence southwesterly in a straight line to a certain point on the northwest branch of the Saint John River, from that point in an irregular line to the southwest branch of the same river, and along this branch to the neighboring highlands which form the watershed; thence along these highlands to the head of Hall's Stream, and down this stream to the 45th degree of north latitude, which was understood to be the line of actual division between Canada and the States of New York and Vermont; and thence along said dividing line to the Saint Lawrence. This line has remained the northeastern boundary to the present time. On 18 June 1822 the line from the intersection of the Saint Lawrence and the 45th parallel westward to the Neebish Rapids was laid down by a commission. Up to 1827 agreements were made regarding portions of the line from Saint Mary's River to the Lake of the Woods and under the treaty of 9 Aug. 1842 the northern boundary line was finally settled as follows. See CANADA — DIPLOMATIC RELATIONS OF THE UNITED STATES WITH.

The Northern Boundary.— By the treaty of 1783 the northern boundary was defined as a line due west from the northwestern point of the Lake of the Woods to the Mississippi. To draw such a line was almost impossible, since the Mississippi did not rise sufficiently far northward and a joint survey was agreed upon but never made. In 1803, when Rufus King concluded his convention, the boundary was defined as the shortest line from the northwest corner of the Lake of the Woods to the Mississippi. Fortunately this convention was never ratified and the Louisiana purchase complicated the question. Various propositions were made but nothing was done, nor could commissioners appointed under the treaty of Ghent reach an agreement. The chief causes of disagreement were the question of the ownership of Saint George's Island, lying in the water communication between Lake Huron and Lake Superior, and the question of a proper boundary through the water communication from Lake Superior to the Lake of the Woods. Accordingly in 1818, when discussing a new commercial treaty to supersede the convention of 1815, Richard Rush and Albert Gallatin proposed that the northern boundary be a line due north or south from the most northwestern point of the Lake of the Woods to the 49th parallel and thence due west to the Pacific. Great Britain was willing to accept this boundary as far as the Rockies but insisted on a joint occupation of the territory west of them lying between the 45th and 49th parallels. The matter was compromised on 20 Oct. 1818, by the acceptance of the line suggested by the Americans as far as the Rockies, west of which the country claimed or possessed by either was to be occupied jointly for 10 years. All these points were finally settled in the Webster-Ashburton treaty of 1842, Article II of that treaty stipulating that

> "from the place where the joint commissioners terminated their labors under the sixth article of the treaty of Ghent, to wit, at a point in the Neebish Channel, near Muddy Lake, the line shall run into and along the ship-channel between St. Joseph and St. Tammany Islands, to the division of the channel at or near the head of St. Joseph's Island; thence, turning eastwardly and northwardly around the lower end of St. George's or Sugar Island, and following the middle of the channel which divides St. George's from St. Joseph's Island; thence up the east Neebish Channel, nearest to St. George's Island, through the middle of Lake George; thence, west of Jonas' Island, into St. Mary's River, to a point in the middle of that river, about one mile above St. George's or Sugar Island, so as to appropriate and assign the said island to the United States; thence, adopting the line traced on the maps by the commissioners through the river St. Mary and Lake Superior, to a point north of Ile Royale, in said lake, one hundred yards to the north and east of Ile Chapeau, which last-mentioned island lies near the northeastern point of Ile Royale, where the line marked by the commissioners terminates; and from the last-mentioned point, southwesterly, through the middle of the sound between Ile Royale and the northwestern mainland, to the mouth of Pigeon River, and up the said river, to and through the north and south Fowl Lakes, to the lakes of the height of land between Lake Superior and the Lake of the Woods; thence along the water communication to Lake Saisaginaga and through that lake; thence, to and through Cypress Lake, Lac du Bois Blanc, Lac la Croix, Little Vermilion Lake and Lake Mamecan and through the several smaller lakes, straits, or streams, connecting the lakes here mentioned, to that point in Lac la Pluie, or Rainy Lake, at the Chaudière Falls, from which the commissioners traced the line to the most northwestern point of the Lake of the Woods; thence, along the said line to the said most northwestern point, being in latitude 49° 23′ 55″ north and in longitude 95° 14′ 38″ west from the observatory at Greenwich; thence, according to existing treaties, due south to its intersection with the 49th parallel of north latitude and along that parallel to the Rocky Mountains."

Hence this line, like the previous ones, was a compromise, the United States gaining the valley of the Red River of the North but sacrificing to Great Britain that portion of the Louisiana Purchase which was watered by the head streams of the Missouri.

The Northwestern Boundary.— West of the Rocky Mountains was the so-called Oregon region. The United States based its claim to this territory on the discovery (11 May 1792) and exploration of the Columbia River by Capt. Robert Gray, the exploring expedition of Meriwether Lewis and William Clark in 1804–06, the establishment of the first trading settlement at Astoria in 1811 (see ASTOR, JOHN JACOB), and the first permanent agricultural settlements soon after 1830, all of which claims were disputed by Spain, Russia and Great Britain. On 20 Oct. 1818, a treaty was concluded (renewed 6 Aug. 1827) providing for the joint occupancy of the territory for 10 years. Under the treaty of 22 Feb. 1819, for the purchase of Florida, Spain conveyed to the United States all her rights, claims and pretensions to the territory north of the 42d parallel and west of the Rocky Mountains. The treaty of 1803 for the purchase of Louisiana was regarded as one of the strongest claims and was persistently urged by our diplomatists who held that under the principle of "continuity of territory" Oregon was included in the Louisiana purchase and that the French had so regarded it. But in 1829 M. Barbé Marbois, who negotiated the Louisiana treaty, declared that while, according to ancient documents, the bishopric of Louisiana was to extend to the Pacific Ocean, these limits at best were merely a matter of hope and expectation and their spiritual jurisdiction was not concerned with the question of dominion or ownership. Most writers agree that the purchase of Louisiana gave the United States no clear title to the Oregon country. The British based their claims on Drake's visit to the coast in 1580, the explorations by Capt. James Cook in 1778, the fact that the coast had been made a trading place jointly with Spain by a convention in 1790, and the surveys of the coast and adjacent islands by Captain Vancouver in 1792 to 1794. Great Britain also denied Spain's claim to the territory on the ground that the latter could not hold the territory by force and thus make good her claim. By the treaty of 17 April 1824 Russia had relinquished her American claims south of 54° 40′ north latitude and as Spain had conveyed her claims north of the 42d parallel the strip between the two constituted the territory in dispute. The United States was willing to continue the boundary along the 49th parallel from the Rockies to the Pacific, but Great Britain objected because the United States thus would possess the lower end of Vancouver Island and the important straits of San Juan de Fuca to the south of the island. Finally, by the treaty of 15 June 1846, both nations accepted the 49th parallel as the boundary from the Rockies to Puget Sound and thence a conventional line through Puget Sound and the Straits of San Juan de Fuca to the ocean. The first part of the line was easy to survey and mark, and the maps and surveys of this part were approved by a joint declaration dated 24 Feb. 1870, but a dispute arose over the line from Puget Sound to the sea. In the first place there was a question whether the line of the 49th parallel terminated where it first reached tide water on the eastern side of Boundary Bay or crossed the bay and Point Roberts to the open sound. Until this was decided the surveyors could not determine the middle of the channel separating Vancouver Island from the continent; and upon the determination of that middle line depended the solution of the question as to what constituted the middle of the channel down to the Straits of Fuca, the settlement of which would determine the ownership of the San Juan Islands. Finally, by the treaty of Washington, 8 May 1871, the matter was referred to the Emperor of Germany, who on 21 Oct. 1872 decided in favor of the United States. Thus the northwestern dispute was terminated and the entire northern boundary was complete. See OREGON QUESTION; SAN JUAN QUESTION.

The Southern and Southwestern Boundaries.— The preliminaries of peace to terminate the French and Indian War (signed at Fontainebleau 3 Nov. 1762 and ratified 10 Feb. 1763) divided French possessions in the United States into two parts. The dividing line was the Mississippi from its source to the Iberville, thence through lakes Maurepas and Pontchartrain to the sea. All east of this line was given to England and all west to Spain. Thus, so far as it included the territory west of the Mississippi and the Island of Orleans, Louisiana was ceded to Spain by France in 1763. At the same time France acknowledged Great Britain as the lawful possessor of Louisiana east of the Mississippi with the exception of the Island of Orleans. Out of this territory Great Britain formed two provinces. A line was run from the junction of the Mississippi and Yazoo rivers due east to the Appalachicola and down that river to the Gulf; all of the country east of the Appalachicola (including the present State of Florida) was called East Florida; West Florida consisted of all of Spanish Florida west of the Appalachicola and of Louisiana east of lakes Maurepas and Pontchartrain and south of the 31st degree of north latitude. This was the situation when peace negotiations were undertaken to terminate the Revolutionary War. The second article of the treaty of peace stated that the boundary should start on the south at a line drawn along the middle of the Mississippi until it intersected the northernmost part of the 31st degree north latitude; thence "to the middle of the river Apalachicola or Catahouche; thence along the middle thereof, to its junction with the Flint River; thence straight to the head of Saint Mary's River, and thence down the middle of Saint Mary's River, to the Atlantic Ocean." South of this line lay Florida, coveted by Great Britain, wherefore a secret article was inserted in the treaty of peace providing that, should she be in possession of West Florida at the end of the war, the southern boundary of the United States should be a line running due east from the confluence of the Yazoo (or Yassous) and the Mississippi to the Appalachicola. Thus the boundary would be 32° 30′ instead of 31°. But as the British were unable to dispossess the Spanish from West Florida, the 31st parallel remained as the boundary. News of this secret article stimulated Spanish ill-feeling toward the United States, and on 25 June 1784, Spain announced that the free navigation of the Mississippi would be discontinued until the limits of Louisiana and the two Floridas had been determined. Negotiations in 1785 and 1792 accomplished nothing, but finally on 27 Oct. 1795, Thomas Pinckney concluded the liberal treaty of San Lorenzo el Real, which recognized the 31st degree as the southern boundary of the United States.

On 1 Oct. 1800, the treaty of San Ildefonso was signed between France and Spain by which Louisiana was retroceded to France. This treaty was very ambiguous in its description of the territory ceded, merely giving to France "the colony or province of Louisiana with the same extent it now has in the hands of Spain and that it had when France possessed it and such as it should be after the treaties subsequently entered into between Spain and other States." Here no definite boundaries are given and the same obscurity obtains in the Louisiana purchase treaty of 30 April 1803, which ceded "the said territory, with all its rights and appurtenances, as fully and in the same manner as they have been acquired by the French Republic, in virtue of the above-mentioned treaty, concluded with His Catholic Majesty," thereby leaving the boundaries still to be determined. See LOUISIANA PURCHASE, THE; UNITED STATES — TERRITORIAL EXPANSION; UNITED STATES — THE LOUISIANA PURCHASE; UNITED STATES — THE WESTWARD MOVEMENT; ANNEXATION.

Louisiana having been purchased, Jefferson set about obtaining West Florida. Though the territory embraced therein had nothing to do with the Louisiana cession to France, Jefferson argued that as Spain owned West Florida which was once a part of Louisiana, and as Spain had ceded Louisiana to France, West Florida was included in the cession, and therefore as Louisiana had been purchased from Napoleon, West Florida now belonged to the United States. On 24 Feb. 1804, a bill, known as the Mobile Bill, became law, nominally giving effect to the laws of the United States within the ceded territory. One section empowered the President "to erect the shores, waters and inlets of the bay and river of Mobile and of the other rivers, creeks, inlets and bays entering in the Gulf of Mexico, east of the said River Mobile and west thereof to the Pascagoula, inclusive, in a separate district." This angered the Spanish Minister, and accordingly, 20 May 1804, Jefferson issued a proclamation the effect of which was to destroy the force of the Act. In 1804 therefore Monroe was sent to Madrid to persuade Spain to acknowledge the Perdido as the eastern boundary of Louisiana, to endeavor to buy the Spanish possessions east of the Perdido for $2,000,000 and to insist upon the right of the United States to Texas, but after months of fruitless negotiations he returned 26 May 1806, and nothing was done for some years.

In the summer of 1810 the American settlers in West Florida revolted against Spain, established an independent government and requested to be annexed to the United States. On 27 Oct. 1810, President Madison issued a proclamation stating that he "deemed it right and requisite that possession should be taken of the said territory in the name and behalf of the United States," and sent William C. C. Claiborne to take possession. Congress passed a bill (signed 15 Jan. 1811) authorizing the President to take and hold East Florida also, if the local authorities were willing or if a foreign power should attempt to occupy it. Thus the United States claimed all the territory from the Mississippi to the Perdido, though her authority did not extend to Mobile and she was not even ready to enforce authority to the Pearl. On 20 Feb. 1811 a bill was signed by the President authorizing the Territory of Orleans to form a constitution and apply for admission as a State. The constitution was framed and the act to admit Louisiana was passed 8 April 1812. The eastern States objected, whereupon Congress (14 April 1812) passed an act enlarging the State. Acting on the principle that West Florida, which had been seized because it was a part of Louisiana, should be treated as conquered territory, Congress divided the district into two halves at the Pearl River and annexed the western half to Louisiana. The eastern portion was incorporated in the Mississippi Territory by an act approved 14 May 1812. Soon a revolution was organized and the city of Fernandina was seized and occupied, but though Spain protested she was too weak to do more and as the War of 1812 occupied the attention of the United States, the matter rested in abeyance for a long time, the situation being further complicated by Jackson's capture of Pensacola in 1814 and 1818, the Amelia Island imbroglio, the Seminole War, and the Arbuthnot-Ambrister affair. Finally on 22 Feb. 1819, a treaty was concluded with Spain to purchase Florida (though not ratified by Spain until 24 Oct. 1820), and on 3 March 1821, Congress authorized the President to take possession of East and West Florida and to establish a government therein. Thus for $5,000,000 and the abandonment of all claims to Texas the United States secured full title to both East and West Florida and thereby settled the southern boundary dispute. As defined in the treaty, the boundary line between the two countries, west of the Mississippi, was to begin at the mouth of the Sabine River (the present western boundary of Louisiana), up that river to the Red River, and along that river to the 100th meridian; from that point due north to the Arkansas River, and following the southern bank of that river to its source in latitude 42° north and thence by that parallel of latitude (the present northern boundary of California) to the Pacific Ocean. All the islands in the Sabine, Red and Arkansas rivers were to belong to the United States.

There was a widespread feeling in the United States that the government could have claimed Texas to the Rio Grande as a part of the Louisiana Purchase. Attempts were made by Clay when Secretary of State and later by President Jackson to substitute the Rio Brazos, or the Rio Colorado, or even the Rio Grande as a boundary in place of the Sabine, or to purchase a part of Texas east of the Colorado, but Mexico, having then become independent of Spain, rejected all offers, and the boundary remained unchanged and uncontroverted until after Texas had entered the Union. As a republic Texas claimed the Rio Grande as its boundary, but as a previous state of the Mexican Republic it extended only as far as the Nueces River. In 1800 the Rio Grande constituted the old boundary of Texas and as Texas still claimed it, the American government re-asserted it and the denial of the claim by Mexico was the immediate cause of the Mexican War of 1846–48. (See also UNITED STATES — THE ANNEXATION OF TEXAS; UNITED STATES — THE MEXICAN WAR). The war was terminated by the treaty of Guadalupe-Hidalgo 2 Feb. 1848, under which, on the payment of $15,000,000, Mexico ceded to the United States all territory north of the Rio Grande and Gila rivers, including Arizona, New Mexico, California, Utah, Nevada, and parts of Colorado and

Wyoming, in all about 525,000 square miles. One part of the boundary was to run along the western boundary of New Mexico, but as it proved difficult to locate the boundaries of old New Mexico that part of the line was never run, but under the so-called Gadsden treaty (q.v.) of 30 Dec. 1853 the boundary between the two countries was to begin —

> "in the Gulf of Mexico, three leagues from land, opposite the mouth of the Rio Grande, as provided in the fifth article of the treaty of Guadalupe-Hidalgo; thence, as defined in the said article, up the middle of that river, to the point where the parallel 31° 47′ north latitude crosses the same; thence due west one hundred miles; thence south to the parallel of 31° 20′ north latitude; thence along the said parallel of 31° 20′ to the 111th meridian of longitude west of Greenwich; thence in a straight line to a point on the Colorado River twenty English miles below the junction of the Gila and Colorado Rivers; thence up the middle of the said river Colorado until it intersects the present line between the United States and Mexico."

Thus the southern and southwestern boundaries of the United States were completed and the only boundary difficulty still to be adjusted is a local question on the Rio Grande.

Interior Boundaries.

The internal divisions of the United States are founded on one or other of the following bases: . (1) Boundaries between the colonies of the different European nations in territory now possessed by the United States; (2) colonial subdivisions made by powers other than England; (3) colonial subdivisions made by the English government; (4) boundary agreements between English colonies and States; (5) State and territorial boundaries by act of Congress.

Boundaries Between Colonies of Diferent European Nations.— The boundary of Maine on the east and north corresponds with the line of division between the French colony of Acadia and the English settlements prior to 1713. The boundary line between Georgia and Florida follows the supposed dividing line between the English and Spanish colonies previous to 1763. The channel of the Mississippi and the line between Alabama and Mississippi on the north and sections of Florida and Louisiana on the south were from 1782 until 1803 the boundary between the Spanish colonies and the United States. From 1819 to 1845 the national boundary line on the southwest followed the present boundaries between Louisiana and Texas and between Texas and Oklahoma. From 1819 to 1848 the 42d parallel, which forms the southern boundary of Idaho and Oregon, constituted the dividing line between Spanish (later Mexican) territory and the claims of the United States and was changed as explained above by the Mexican War and the Gadsden treaty. The boundary between New York and Connecticut nearly coincides with that decided upon 19 Sept. 1650, by arbitrators appointed by Governor Stuyvesant of the Dutch colony of New Netherland and the United Colonies of New England. The boundary between New Netherland and the colony of New Haven was to begin at Greenwich Bay and to run northerly 20 miles into the country and beyond «as it shall be agreed,» but nowhere was it to approach the Hudson nearer than 10 miles. Delaware's present western boundary in the main follows the subdivision between the Dutch colony of New Sweden and the English colony of Maryland.

Colonial Subdivisions by Powers Other than England.— In 1655 Governor Stuyvesant of New Netherland forcibly annexed New Sweden, the Swedish colony on the Delaware, to New Netherland, and in 1664 the English, having taken possession of the colony, asserted their authority over the Swedish colony, naming it «Delaware Territory.» But New Netherland never possessed definite boundaries and was not subdivided, wherefore the present map bears no impression of changes made. The Illinois country was at first a part of Canada, but the French later annexed it to Louisiana. When the Floridas were in possession of the English (1763–82) the Appalachicola River constituted the boundary between the regularly established English colonies and East and West Florida, and the upper waters of that river now form a part of the boundary line between Georgia and Alabama. During the period of Spanish ascendency in East and West Florida (1782–1803) the dividing line was the Perdido River, and on the north the 31st parallel comprised the boundary; hence the present boundary between Florida and Alabama, particularly the Perdido River. Spanish and Mexican subdivisions within their own territories are scarcely discernible on the present map, save that the Red River, now constituting most of the southern boundary of Oklahoma, conforms nearly to the boundary line between Spanish Louisiana and Texas. The southern boundary of California from the Colorado to the Pacific corresponds with the old Spanish dividing line between Upper and Lower California.

Subdivisions by the English Government or by Agreements Between Colonies and States.— The cavalier manner in which European monarchs laid claim to and granted away American lands resulted in vexatious and extended disputes, which may best be described by dealing with the colonies and States as nearly as possible in geographical order, though all disputes between States cannot be amplified.

Under the grant to the Plymouth Company the Earl of Stirling claimed land on the coast of Maine which was afterward granted to the Plymouth Company and by order of James I that company issued a patent «for a tract of the main land of New England, beginning at Saint Croix and from thence extending along the seacoast to Pemaquid and the River Kennebeck.» Stirling's heirs sold this to the Duke of York in 1663. In 1622 the Plymouth Company granted to Sir Ferdinando Gorges and Capt. John Mason a tract called Laconia between the Merrimac and Kennebec rivers, which included New Hampshire and all the western part of Maine. In 1629 Mason and Gorges divided their territory in two by the Piscataqua, Gorges taking the territory east of the river and calling it Maine. In 1639 Charles I granted to Gorges a charter which virtually confirmed the Plymouth patent of 1622. Grants of part of Maine were made to the Duke of York in 1664 and 1674; on 19 Sept. 1686, Pemaquid and its dependencies, forming Cornwall County, under the jurisdiction of New York, were annexed to the New England government; and in 1691 the provinces of Maine and Acadia (or Nova Scotia) were incorporated with the colonies of Massachusetts Bay and Plymouth into the royal province of Massachusetts Bay, The right of government thus acquired over the district of Maine was exercised by Massachusetts until 1819 when Maine took steps to be admitted as a State.

The northern and eastern boundaries of Maine were settled by the United States and Great Britain (see subtitle *Northeastern Boundary*) but the western boundary was a source of contention with New Hampshire, which had been erected into a province in 1679. In 1731 commissioners from New Hampshire and Massachusetts failed to settle the dispute, but in 1837 commissioners appointed by neighboring provinces fixed the boundary substantially as it is to-day:

> "Beginning at the entrance of Pascataqua Harbor and so to pass up the same to the River Newhichawack and thro' the same into the furthest head thereof and thence run north 2 degrees west till 120 miles were finished, from the mouth of the Pascataqua Harbor or until it meets with His Majesty's other governments."

On 5 Aug. 1740, this was confirmed by the King, but after Maine's admission as a State in 1820 a dispute arose and in 1829 commissioners surveyed the line which was accepted by both States. Between 1828 and 1858 the forest lands through which the boundary line ran were cleared and forest fires swept large tracts of territory, resulting in the obliteration of the line markers. Hence in 1858 the two States provided for a new survey from Fryeburg to the Canada line. In 1874 the line was surveyed and marked.

The dispute over the boundary between Maine and New Hampshire involved also the settlement of a dispute regarding the boundary between the latter province and Massachusetts. Commissioners being unable to agree in 1731, another board of commissioners met in 1737 and submitted a report to the King who in 1740 declared —

> " That the northern boundary of the province of Massachusetts be a similar curve line pursuing the course of the Merrimac River, at three miles distance, on the north side thereof, beginning at the Atlantic Ocean and ending at a point due north of the Pautucket Falls, and a straight line drawn from thence, due west, till it meets with His Majesty's other governments."

New Hampshire claimed as her southern boundary a line due west from a point on the sea three miles north of the *mouth* of the Merrimac, but Massachusetts contended that the King meant three miles north of *any part* of the river. In 1741–42 New Hampshire proceeded to run and mark the line, but in 1774 an investigation, based on actual surveys, showed that the previous line had run so far north of west as to deprive New Hampshire of a large tract of land. In 1825 commissioners were appointed to run the line and monuments were erected accordingly. In 1885 the line was resurveyed and marked, but a dispute arose over the boundary west of Pawtucket Falls. In 1742 Richard Hazen had marked this part of the boundary, running the line from a point three miles north of Pawtucket Falls, across the Connecticut River to the supposed boundary line of New York, on what he believed to be a due west course from the place of beginning. When the matter was adjusted in 1894 the Hazen line was settled upon and re-marked from Pawtucket Falls to the northwest corner of Massachusetts.

New Hampshire also asserted her ownership of the territory now embraced within the State of Vermont, thus coming into conflict with New York, which colony claimed all the country west of the Connecticut River under the Duke of York's charters of 1664 and 1674. On appeal to the King an order in council was issued 20 July 1764 declaring "the western banks of the river Connecticut, from where it enters the province of Massachusetts Bay, as far north as the forty-fifth degree of northern latitude" to be the boundary line. Despite this ruling the controversy continued, but the line was finally accepted and now constitutes the boundary between Vermont and New Hampshire.

On 15 Jan. 1777, Vermont declared herself independent of New York and claimed all territory west to the Hudson, and from its source north to the international boundary, including a tract along the west shore of Lake Champlain. A part of New Hampshire, too, sought to join Vermont at one time. Massachusetts assented to Vermont's independence in 1781, in 1782 Vermont settled her differences with New Hampshire, on 6 March 1790 New York passed an act assenting to Vermont's admission to the Union and defining her boundaries, and in 1791 she was admitted. In 1814 the line between New York and Vermont was surveyed and marked by a joint commission, but in 1876 the line was changed (and ratified by Congress 7 April 1880) by a cession of a small tract from Vermont to New York comprising that part of Fairhaven, Rutland County, west of the middle of Poultney River.

The boundary between Massachusetts and Rhode Island was a subject for dispute for more than 200 years and twice was before the Supreme Court. As early as 1642 the line was marked in part and in 1710–11 commissioners from both colonies agreed upon the north line of Rhode Island, their report being approved by the respective legislative bodies. In 1719 this line was surveyed, but subsequent investigations showed numerous irregularities. In 1741 the line between Massachusetts and the eastern part of Rhode Island was fixed by commissioners but Rhode Island was dissatisfied and appealed to the King who, on 28 May 1746, affirmed the report of the commissioners. Under this decree the line was run to the supposed southern boundary of Massachusetts and in 1748 the Rhode Island legislature appointed commissioners to continue the line to the Connecticut corner. Various ineffectual attempts were made to secure an agreement, and in 1832, all other measures having failed, Rhode Island by a bill in equity brought the matter before the Supreme Court, which in 1846 decided in favor of Massachusetts. Meanwhile in 1844 commissioners were appointed by both States to mark the boundary, part of the line as marked being accepted by both States and monuments erected thereon; but Massachusetts would not ratify the agreement regarding the other part and therefore brought suit in the Supreme Court for an adjudication. In 1860, however, both States agreed upon a conventional line which was confirmed by a decree of the Supreme Court in 1861. Further discussion regarding the matter occurred, but it was finally settled in 1880–81 when both States decided to erect monuments on the conventional line.

Massachusetts entered also into controversies with Connecticut and New York regarding boundaries. In 1713 commissioners from Massachusetts and Connecticut agreed upon a line which gave to Massachusetts certain northern frontier towns (Woodstock, Suffield, Enfield and Somers), but in 1749 Connecticut asserted that the colonies had no legal right to transfer territory without the King's approval, and as the line had not been approved by the King, the towns were again under her jurisdiction. Massachusetts appealed to the King but he sustained Connecticut. In 1791 a fruitless attempt was made to settle the line but not until 1803 was it surveyed and marked. In 1826 the line between Connecticut and Massachusetts east of the Connecticut River was surveyed and marked by commissioners from both States. New York claimed that her charters of 1664 and 1674 extended her territory to the west bank of the Connecticut River while Massachusetts claimed to the South Sea. Many attempts at adjustment were made and finally in 1787 commissioners appointed by Congress ran the line as follows: «Beginning at a monument erected in 1731 by commissioners from Connecticut and New York, distant from the Hudson 20 miles and running north 15° 12′ 9″, east 50 miles 41 chains and 79 links to a red or black oak tree marked by said commissioners, which said line was run as the magnetic needle pointed in 1787.» On 16 Dec. 1786 a joint commission from the two States settled the Massachusetts claims to western lands, that State relinquishing the territory to New York and receiving in return the right of soil and pre-emption right of Indian purchase west of the meridian passing through the 82d milestone of the Pennsylvania line, excepting certain reservations on Niagara River. The title to a tract known as «The Boston Ten Towns» lying east of this meridian, previously granted by Massachusetts, was confirmed. In 1853 a small tract of land in the southwest corner of Massachusetts known as «Boston Corner» was ceded to New York, Congress confirming the cession two years later.

In 1703 Rhode Island's western boundary was settled by commissioners from that colony and Connecticut, but when the line was run Rhode Island refused to accept it and appealed to the King, who in 1726 confirmed the agreement of 1703. Two years later the line was run as agreed. In 1839 the two States appointed commissioners to survey the line and erect monuments and their report was ratified in 1846.

A dispute arose between Connecticut and New York over their boundary line, New York claiming as far east as Connecticut River under the Duke of York's charter of 1664. Commissioners appointed by the King determined that Connecticut's southern boundary was Long Island Sound, and its western boundary Mamaroneck River and a line drawn north-northwest from the head of salt water in it to Massachusetts. In effect this was a line 20 miles east of the Hudson with a starting point at a place on Mamaroneck River. Neither party being satisfied, joint commissions were appointed several times to fix the line but no action was taken until a question of jurisdiction arose which Connecticut in 1855 proposed to settle by a new survey. Several sets of commissioners were appointed and finally in 1860 the line was run by New York commissioners alone, following a survey made in 1731. In 1880 both States appointed commissioners who ratified the line surveyed in 1860 and this agreement was confirmed by Congress 26 Feb. 1881.

The Duke of York's grant to Sir George Carteret in 1664 plainly defined the boundary line between New York and New Jersey, but the line remained unsettled until 1769 when commissioners appointed by the King fixed it substantially where it is to-day. On the south the only thing to do was to find the beginning of 43° north latitude where the Delaware crossed it and then run a line westward. In 1774 New York and Pennsylvania appointed commissioners for this purpose; the work was finished in 1787 and ratified in 1789. In 1781 New York surrendered all her claims to lands west of her present western boundaries, and in 1792, in order to get an outlet on Lake Erie, Pennsylvania purchased from the United States the triangle bordering on that lake. Connecticut also disputed with Pennsylvania the possession of the so-called Wyoming Valley in the latter colony, but when the Articles of Confederation went into effect Congress decided the dispute against Connecticut. There were also disputes between New Jersey and Pennsylvania, New Jersey and Delaware (particularly regarding jurisdiction over Pea Patch Island), Maryland and Delaware, and Delaware and Pennsylvania, all of which were settled without great difficulty, but the details cannot be given here.

Virginia was first dismembered by the grant of Maryland to Lord Baltimore and her protest was of no avail. In 1668 commissioners marked the present boundary across the peninsula, but in so doing ran the line so far north of east as to rob Maryland of 23 square miles of her territory. The grant by Charles II of the «northern neck,» or the region between the Rappahannock and Potomac rivers, which region was inherited by Lord Fairfax, gave rise to other disputes regarding the southern boundary of Maryland. Lord Baltimore's charter described the southern boundary as marked by the farther, that is, southern, bank of the Potomac from the Chesapeake to the farthest source of the river, the western line to run from this point to the 40th parallel. In 1736 commissioners were appointed to ascertain the true sources of the Rappahannock and Potomac rivers, a line being run 10 years later in accordance with their report. The Fairfax stone was set up at the source of the north branch of the Potomac, but Maryland contended that her lands extended to the source of the south branch. In her constitution of 1776 Virginia surrendered all claim to territory within the charter limits of Maryland, but claimed and exercised jurisdiction over all lands up to the northern branch. A joint commission, appointed in 1795, accomplished nothing, but finally, in 1852, Maryland conceded Virginia's claim for the northern branch of the Potomac and the Fairfax stone as the starting point of the line. In 1854 Virginia appointed a commission but the work was interrupted by the Civil War and the creation of the new State of West Virginia relieved the old commonwealth of the controversy, a suit between West Virginia and Maryland being instituted subsequently to secure an adjustment. On 21 Feb. 1910 the Supreme Court decided that the boundary began at a point where the north and south line from the Fairfax stone crosses the Potomac and «running thence northerly» to the Pennsylvania border — thus recognizing the old Deakins line. The location of the eastern part of the Maryland-Virginia line was also a source of friction. In 1668 the line from Watkins Point eastward was begun but never finished, and the line from Watkins Point westward across the bay to the Potomac was not touched until the meeting of commissioners at Mount Vernon in 1785 when an agreement was reached that the waters of the Chesapeake and Potomac should be mutually free to the citizens of each State. By that agreement Smith's Point at the mouth of the Potomac, rather than Cinguack of the Maryland charter, farther south, was made the western end of the line dividing the bay. In 1858 commissioners were appointed to run the line from Watkins Point to the Atlantic, the portion of the line between the Pocomoke River and the Atlantic being run, but the exact location of Watkins Point being too difficult to determine. In 1867 Virginia claimed that the line across the bay should include the Virginia settlements on Smith Island and extend through the northern portions of Watkins Point. In 1874 the question was submitted to arbitration, the commission in 1877 confirming Maryland's right to the Potomac and its southern bank, granting Virginia's claim to a part of Smith Island, dividing the rights to Tangier and Pocomoke sounds, designating the southernmost part of Watkins Point as the boundary, and dividing the Pocomoke River between the States up to the old Calvert-Scarborough line, run in 1668. On 31 May 1910 the Supreme Court decided that, consistent with the continued previous exercise of political jurisdiction, the uniform southern boundary of Maryland was at low-water mark on the south bank of the Potomac to the intersection of the north and south line between Maryland and West Virginia, thus establishing West Virginia's proprietary right on the south shore to low-water mark.

Maryland also disputed with Pennsylvania over the boundary. According to Penn's charter the southern boundary of Pennsylvania was to be drawn at a radius of 12 miles from Newcastle and continued westward from the point where the southern end of this segment cut the 40th parallel. Such a line was impossible as Newcastle was some distance below this parallel; nevertheless Penn contended for it. He also induced the Duke of York to grant him the Delaware peninsula which was inside Baltimore's possessions and then forced Baltimore to divide this land with him. In 1732 Penn's sons secured from Baltimore a written agreement conceding the northern boundary as designated by them, but on learning that this agreement signed away 2,000,000 acres he refused to yield. In 1760 the dispute terminated and seven years later Charles Mason and Jeremiah Dixon were employed to mark the line, the result being the famous Mason and Dixon line (q.v.). It was resurveyed in 1901.

The dismemberment of Virginia on the south began with the Carolina charter of 1663, amended and reissued in 1665 so as to include all lands between 36° 30′ and 29° extending westward to the South Sea. The line between Virginia and Carolina was not established until 1728. In 1779 the survey was again taken up to extend the line to the Tennessee River. The North Carolina officers declared the line to be too far south and began a survey two miles farther north, running the so-called Henderson line as far as the Cumberland Mountains. The Virginia officers continued the old southern line, known as the Walker line, as far as the Tennessee. The people living between the two lines were uncertain to whom they owed allegiance, and in 1801 the two States appointed a joint commission to determine the true boundary. Both accepted the compromise line as recommended, which ran half way between the old lines from White Top Mountain (the northeast corner of Tennessee) to Cumberland Mountain (the southwest corner of Virginia). In 1856 the line was re-marked but the work was rejected by Virginia and in 1892 she brought suit against Tennessee in the United States Supreme Court to have the new line placed nearer latitude 36° 30′. The decision went against her, but in 1900 a commission was appointed to re-mark the boundary, the report being rendered in 1903. An interesting feature was the cession of the north side of Main street, Bristol, Tenn., to Virginia by the Tennessee legislature.

The continuation of the Walker line west of the Cumberland Mountains as the boundary between Kentucky and Tennessee became a source of controversy, Kentucky claiming the line to be too far north. When the two States began to divide the lands west of the Cumberland, they found that the Walker line struck the Cumberland 16 miles north of 36° 30′ (the northern charter boundary of Carolina) thus giving Tennessee 2,500 square miles. Kentucky did not demand a new survey but secured a more southerly boundary to the west.

Virginia also had a controversy with West Virginia over the possession of Berkely, Frederick and Jefferson counties. When the latter State was organized Union troops were in possession of those three counties, and in May 1862 the «restored government» of Virginia provided that these counties might join West Virginia whenever their voters should ratify the constitution of that State, which arrangement was confirmed by Congress in March 1865. In 1865, however, the reconstructed Virginia legislature repealed the act of 1862 and to settle the case brought suit against West Virginia in the United States Supreme Court. In 1870 that court decided against Virginia.

As first established by a joint colonial commission (1735–46), the boundary line between North and South Carolina began at Goat Island (33° 56′), ran northwest to 35° and then west to the old Salisbury and Charleston road near the Catawba River and along this road to the southwest corner of the Catawba Indian lands. In 1764 this line was resurveyed and in 1772 continued in its present location to a point near the Blue Ridge. In turn the territory of South Carolina was decreased by the Georgia charter of 1732. In 1762 a dispute arose over the boundary between the two States which was decided in 1787 in favor of Georgia by a convention at Beaufort, S. C., when the present line between the two States was agreed upon.

In 1787 South Carolina ceded to the United States her claim to a strip of land between the Tugaloo River and the North Carolina boundary, 12 or 14 miles wide and 200 miles long, extending to the Mississippi. In 1802 the National government gave to Georgia that part of the territory now in the State of Georgia and recognized the line of 35° as the northern boundary of the cession. Walton County was organized in the newly acquired district but the line dividing it from North Carolina was not scientifically determined. In 1806 Georgia appealed to Congress to adjust the line and rejected a survey made in 1807 but as the trend of opinion was so much in favor of North Carolina the dispute was dropped. In 1817 Georgia and Tennessee appointed a commission to establish the line of 35° along their border and the report of 1819 was acceptable to both States, but an independent survey made a few years later showed that the existing line was 35 chains south of the real 35° line. Nothing was done until after the war. In 1887–89 and 1893 both States appointed commissioners to establish the line but nothing was accomplished, and a tradition still exists in Georgia that Tennessee wrongfully exercises jurisdiction over some of her territory.

In 1819 the line of 35° was run from the Alabama to the Mississippi River, the survey being known as the Winchester line, but 10 years later Mississippi, coveting the rich country about the Chickasaw Bluffs (Memphis), contended that the line was too far south. In 1831 a report was rendered showing that the line was too far north, but in 1837 a new survey by a joint commission established the true line so far south of the Winchester line that Tennessee received nearly 200 square miles and this survey is the present boundary.

The purchase of Florida in 1819 occasioned two boundary controversies, the first being over the line between Georgia and Florida. The line of the cession of 1763 extended from the junction of the Chattahoochee and Flint rivers to the source of the Saint Mary's and along that stream to the Atlantic, which line was confirmed in 1795 by a treaty between Spain and the United States. In 1798 Andrew Ellicott made a survey of the line between Spanish and American dominions and established a mound at what he considered the head of Saint Mary's River. In 1802 and again in 1818 new surveys were made, Georgia contending for the Watson line which ran south of Ellicott's mound. Three different surveys were made and in 1850 Florida filed suit in the Supreme Court, but in 1857 both States agreed to make a new survey. Work was begun in 1859 but in 1861, when the new boundary (the Orr and Whitney line) was found to be north of the line she contended for, Georgia repudiated the survey. Finally in 1866 both States agreed to accept the Orr and Whitney line and Congress ratified this action in 1872.

When the question of statehood for Missouri was under discussion, the people requested that the western and northern boundaries be the same as the surveys of 1808–16 in accordance with the Indian treaty of 1808. Congress assented, mentioning certain falls in the Des Moines River as the eastern terminus of the survey. In 1837 three men, sent by Missouri to locate the northern boundary, after exploring the Des Moines for about 100 miles, determined upon what they thought was the rapids and then surveyed a line to the Missouri, thus adding to the State a strip 100 miles wide and 200 miles long. Congress disregarded that survey and admitted Iowa with the old Indian boundary, but in 1848 Missouri brought suit against Iowa only to have her complaint dismissed.

The enabling acts of Louisiana and Mississippi included within their boundaries some islands within three leagues of the coast of both States. The peninsula of Saint Bernard and the adjacent hummocks were claimed by both; the joint boundary commission of 1901 could not reach an agreement, and appeal was made to the Supreme Court. In 1906 that tribunal awarded the territory in dispute to Louisiana, declaring that the enabling acts did not conflict since the grant of lands within three leagues of the coast of Mississippi referred to a line of sea islands extending from Mobile, Ala., to Cat Island, Miss., and that the deep water channel from the mouth of the Pearl River through the islands and peninsulas to the open waters of the Gulf of Mexico is the boundary between the two States.

A part of the North Carolina-Tennessee boundary was somewhat obscure. The surveyors intended to follow the line of the high range of mountains lying between the States but south of the Tennessee River the range divides into two branches (Hangover Ridge on the east and Fodder Stack on the west) which unite 10 miles away. A dispute arose over which branch was the proper line but in 1900 the United States Circuit Court decided in favor of Hangover. There was a similar break in the boundary range between County Corners and Bryson's Gap and in 1902 the same court decided in favor of the western spur.

Water courses have occasioned many interstate disputes, especially regarding jurisdiction over the shore line, questions of boundary, property rights and jurisdiction caused by change of channels. When Georgia surrendered her western lands in 1802 she stipulated that her boundary extend "west of a line beginning on the western bank of the Chattahoochee River, where the same crosses the boundary between the United States and Spain, running up the said river and along the western bank thereof." In its lower course the river frequently rises and overspreads its banks as much as a half-mile. Alabama held that its rights extended to the low-water line, but Georgia claimed jurisdiction to the high-water mark. After a long controversy Alabama sued Georgia in the Supreme Court, but the decision of 1859 went against her, the court holding that the bed of a river "is that part of the soil alternately covered and left bare" by the water. In 1877 an extraordinary change occurred in the course of the Missouri River at a point between Omaha, Neb., and Council Bluffs, Iowa, as a result of which Nebraska claimed that the boundary between the two States was the new channel of the river. Suit against Iowa to establish the new boundary was brought in the Supreme Court, but the court held that neither gradual changes in the channel of a river, caused by accretion or decretion, nor a sudden break and a complete transformation, rendering the old river bed dry land, would change the boundary. The Supreme Court has rendered similar decisions in disputes between Missouri and Kentucky over the possession of Wolf Island; between Arkansas and Mississippi over Island No. 76; between Tennessee and Arkansas over lands near Devil's Elbow, above Memphis; between Missouri and Nebraska over McKissick's Island; between Kentucky and Indiana over Green River Island; and between Washington and Oregon over the ship channel in the Columbia and the ownership of Sand Island. A suit between Arkansas and Tennessee over an island in the Mississippi is still pending in the Supreme Court.

In 1893 a dispute was decided by the Supreme Court between Iowa and Illinois regarding the taxation of bridges over the Mississippi. Iowa claimed that Illinois taxed all bridges and other structures on the river not to the middle of the stream but to the middle of the steamboat channel where navigation was possible and that in one case at Keokuk, Iowa, she had taxed so much of the bridge as extended to a point 941 feet west of the middle of the main arm or body of the river at that point. The Illinois Supreme Court had declared that primarily a river is a medium of navigation and as a channel might be on either side of the thread of the stream it would be unjust to subject the channel to the control of another State when the free navigation of the river was essential to commerce. Accordingly, in deciding the case, the United States Supreme Court held that the true line in navigable rivers between States is the middle of the main channel — that is, the thread of the stream, the thalweg or mid-channel, or in case there be several channels, the middle of the principal one or the one usually navigated.

On 11 Jan. 1805, Congress erected the Territory of Michigan out of «all that part of the Indiana Territory which lies north of a line drawn east from the southerly bend, or extreme, of Lake Michigan, until it shall intersect Lake Erie, and east of a line drawn from the said southerly bend through the middle of said lake to its northern extremity, and thence due north to the northern boundary of the United States.» When the exact location of the southerly bend of Lake Michigan became known Michigan's southern boundary was found to overlap the territory assigned to Ohio, and a serious dispute arose over a wedge-shaped strip across Ohio, averaging six miles in width, embracing 468 square miles and including the lake port of Toledo and the mouth of the Maumee River. On 20 May 1812, Congress passed an act to determine the boundary but owing to the war the lines were not run for some time and then not satisfactorily. Another act was passed 14 July 1832 under which surveys were made and reports rendered in January 1834 and November 1835. In the summer of 1835 the disputed territory was the scene of much disorder and some gunpowder was wasted in what was known as the Toledo War. The governor of Ohio appointed a commission to mark, under armed protection, the line claimed by that State, but Governor Mason gave orders that the militia should be called out and the Ohio commissioners arrested «the moment they stick the first stake in the soil of Michigan.» The Ohio surveyors attempted to run the line and were arrested and the militia was called out by both States, but no human blood was shed and the matter was settled by politicians. In December President Jackson submitted the controversy to Congress which gave the disputed tract to Ohio and by an act of 15 June 1836 offered Michigan the whole of what to-day is her upper peninsula. A convention held in December 1836 approved the proposition and on 26 Jan. 1837 Michigan was admitted with the territorial limits she possesses to-day.

Article V of the Ordinance of 1787 provided that the southern boundaries of Michigan and Wisconsin were to be an east and west line drawn through the southerly bend of Lake Michigan — 41° 37′ 7.9″, according to Talcott's survey. In 1815 Illinois applied for admission to the Union with a northern boundary of 42° 30′, which would give her an additional strip 61 miles, 19 chains and 13 links in width, embracing 8,500 square miles and including numerous lake and river ports. In the act of 1836 erecting Wisconsin Territory, the boundary was given as 42° 30′, as in the Illinois enabling act of 1818, but Wisconson requested a readjustment of the line to conform with the Ordinance of 1787, claiming the 14 northern counties of Illinois. In two State constitutional conventions attempts were made to have the dispute referred to the United States Supreme Court and to admit Wisconsin with indefinite boundaries, but they failed and the State was admitted in 1848 minus the 8,500 square miles in dispute.

Michigan at first cared little about her upper peninsula, wherefore Congress proposed to give it to Wisconsin. After that territory was formed Congress ordered a survey of the line between the two to be made but soon learned that the boundary could not be run because as laid down by Congress it did not agree with the topographical features of the country. Wisconsin demanded the territory in question, threatening secession and hinting that force might be used, but when Congress on 6 Aug. 1846 provided for her admission to the Union, the boundary line was changed only in a manner to make it conform more closely to the actual geographical features.

State and Territorial Boundaries by Act of Congress.— Art. IV, Sec. 3, ¶ 2 of the constitution provides that «the Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States,» and under this power the United States has defined and altered the boundaries of territories and has admitted new States under the boundaries defined in the enabling acts. When the Ordinance of 1784 was under discussion to provide a government for the Northwest Territory, Jefferson suggested a plan of dividing the territory into 10 States, but this ordinance never went into effect and as defined by the Ordinance of 1787 the Northwest Territory nearly coincides with the States from Ohio to Wisconsin. The present State of Oklahoma was formed by the combination of the former Territory of Oklahoma and Indian Territory. Oregon, Washington and Idaho nearly conform to the old Territory of Oregon. When Arizona and New Mexico entered the Union in 1912 they were admitted with their previous territorial boundaries. All the Congress-made States have parallels or meridians or both as their boundaries, Colorado and Wyoming being bounded by four straight lines. Most of California's eastern boundary is a straight line running approximately southeast to northwest. Through most of their course, the Ohio and Mississippi form State boundaries, and sections of the boundaries of a few States are formed by the Missouri, Arkansas, Des Moines, Wabash, Red, Colorado and Columbia rivers. East of the Mississippi and west of the Appalachians, a group of nine States are nearly of a size, varying from 36,000 to 58,000 square miles, and on the west side of the Mississippi there is a group of five States laid out on about the same scale (save Missouri, which is larger). West of these to the Pacific the States are larger, the smallest (Oklahoma, North Dakota and Washington) averaging 70,000 square miles, while seven of the States embrace more than 100,000 square miles, California rising to 158,000. Texas is the largest with 265,000 square miles. Few of the outlying territories of the United States are large enough to be subdivided. Congress has divided Alaska into four districts, Porto Rico into seven and the Philippines into 27 provinces, besides separate areas for the Moros and other wild tribes.

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BOUNTIES, a term applied to a grant or benefaction from the government to those whose services directly and indirectly benefit it, and to whom, therefore, it desires to accord some recompense, or at least recognition.

Nature and Operation.— In law or commerce a fiscal bounty is a premium paid by the government to the producers, importers or exporters of certain articles or to those who employ ships in certain trades. This is done either to foster a new industry during its infancy or to protect an old one which is supposed to be of especial importance to the country. When the treasury actually pays a certain sum for each unit of goods produced or exported, the bounty is direct or open. It is an indirect or concealed bounty when the government grants some favor which reduces the cost of producing or marketing the goods, e.g., where goods for export are transported by government-owned railways at specially low rates, in which case the reduction given virtually constitutes a bounty. Sometimes imperfect methods of administration result in an unintentional grant of a bounty, especially in connection with drawbacks on duties.

In effect a bounty encourages the production or export of the article upon which it is paid, and differs from a protective duty in that it enables the producer to sell at a lower price than he could afford otherwise and to recoup his losses at the expense of the treasury instead of the consumer. Thus unless nullified by foreign countervailing duties a bounty aids in both foreign and domestic markets, while protective duties facilitate sales only in the home market. Bounties bring to the industries affected capital and labor which otherwise would probably be employed in other channels of industry. If the bounties be applied to industries subject to diminishing returns, additional products are obtained at enhanced cost, and the consumer receives less benefit than might be obtained if the same capital and labor had been employed in other industries. In the case of industries subject to increasing returns, the converse would be true. Hence it is said that greater benefits might accrue to consumers if commodities subject to diminishing returns were taxed and a part of the taxes used as bounties for commodities subject to increasing returns. Some bounties may be justified on other than purely economic grounds, such as bounties to shipbuilding and navigation, in the interest of national defense.

All bounties or premiums are not offered for the encouragement of domestic talent and industry to the exclusion of foreign competition. The British and French governments and also private associations offer many of their bounties to competitors indiscriminately; and where the object is universal improvement, the offer of a bounty is one of the appropriate modes of encouragement, though others concur with it, such as the monopolies of copyrights and patents, and the honors and distinctions conferred on those who make any important improvement. The productions of extraordinary skill and ingenuity may also properly be made the subjects of bounties or premiums, since in this way a competition is excited by which none suffers and all the effects of which are beneficial to a community.

Federal and State Bounties.— The national government has encouraged industries in two ways by direct grants of money to private concerns, namely, ship subsidies and bounties, but since ship subsidies have usually been granted to encourage mail transportation lines, they may best be discussed elsewhere. (See SHIP SUBSIDIES; SHIPPING; COMMERCE). Under the operation of the tariff, drawbacks have been paid on exports, but since, in its final analysis, a drawback is merely the refund of a duty it cannot be considered a contribution from the treasury.

Under an act of 1790 a bounty was paid on dried and pickled fish exported from American fisheries, the sum of 10 cents per quintal being paid on the former and 10 cents per barrel on the latter. In reality this amounted to a drawback on the salt which was subject to duty and the so-called bounty was repealed in 1807. The most noteworthy recent example was the bounty on domestic sugar production constituting a part of the McKinley tariff act of 1 Oct. 1890. The act provided that between 1 July 1891 and 1 July 1895 the treasury should pay a bounty of two cents a pound to producers of cane, beet and sorghum sugar grown in the United States, provided the sugar tested not less than 90 degrees by the polariscope, and for sugar testing between 80 and 90 degrees the bounty was one and three-fourths cents. The bounty was in the nature of a contract (made with each and every person in the United States engaged in cultivation of such varieties of sugar) providing that, if their produce attained a given standard of saccharine strength, they would receive the bounty provided therefor by the appropriation from the treasury. It was necessary also that the producer secure a license and file various statements concerning the amount of his crops. While the act greatly stimulated the sugar industry in the country, the bounty was repealed by the act of 27 Aug. 1894. During the years 1892 and 1897, while the bounty act was in force, $36,041,134 was disbursed to sugar growers, most of which went to the producers of cane sugar in Louisiana, the beet sugar producers receiving only about $2,000,000, while an insignificant amount was paid to sorghum and maple sugar producers.

Bounties have been granted freely by the States, not only of lands and money to canals and railroads, but also of large sums for irrigation purposes, roads and various other public works. In order to induce industrial and manufacturing firms to locate in some city or State, taxes for a period of years have sometimes been remitted. Many States give bounties for the extermination of destructive and dangerous animals, nearly all the Western States offering liberal sums for dead coyotes, wolves and mountain lions. Many cities too have granted bounties, such as franchises to street railway companies and to water, lighting and other public service corporations.

Army and Navy Bounties.— Even in colonial times money was paid to encourage men to join the army or to extend their service. In general the bounty has been given to volunteers, the amount varying with the need and difficulty of procuring recruits. The New England militia which joined the British army to invade Canada received a money bounty as did those who wintered at Louisburg in 1760. The Continental army received small grants of money and land from Congress, but as the enemy was paying £10 apiece for recruits Washington feared the loss of his army unless Congress was more liberal. The States gave bounties of varying values, Virginia and New York offering land; but in 1780 conditions came to such a pass that Washington had to offer $200 each to retain his veterans, and finally, in order to disband the army in 1783, induced Congress to grant the officers five years' full pay.

During succeeding wars the soldiers were subsidized by land grants as will be shown later, but in the Civil War, after 1861, all volunteers received bounties, the towns and States competing with each other and with the Federal government, while many individuals hired substitutes to take their places at the front. To prevent desertion the bounty was paid by instalments, $400 being given to veterans who re-enlisted. By 1865, owing to the magnitude of the war and the difficulty of securing recruits, as much as $1,500 was offered, and these high prices resulted in much of the so-called bounty-jumping. (See BOUNTY-JUMPER). During the war the States paid nearly $300,000,000 in bounties. Congress has not approved bills for the «equalization of bounties» by subsequent Federal payments.

The United States laws formerly authorized various forms of prize money, including a bounty for the sinking or destruction of an enemy's vessel, but such bounties were abolished by the act of 1899, so that both army and navy are on an equal basis as concerns pay. But there are some forms of bounty, such as increased pay for re-enlistment, accompanied for the navy by allowance of four months' pay, extra pay, prizes for marksmanship and for the engineers of a successful cruiser and gratuities for winners of a medal of honor.

Land Bounties.— The practice of granting lands to soldiers goes back to colonial times. By royal proclamation of 7 Oct. 1763, American colonial governors were prohibited from making land grants west of the sources of the rivers flowing from the west or northwest into the Atlantic. This was to quiet the apprehensions of the Indians in the Ohio regions that their lands were to be granted out. But Lord Dunmore of Virginia was empowered to offer bounties of land to all officers and soldiers who had served in the French and Indian War, and should personally apply to him for warrants — 5,000 acres to each field officer, 3,000 to captains, 200 to subalterns or staff officers and 50 to private soldiers — up to 200,000 acres, from the King's domain either in Canada or Florida, or the «Crown lands.» This was understood by Americans to mean precisely the above western lands, and those who had the ability and foresight selected choice tracts beyond the Alleghanies provisionally in hope that the government would validate them later. Washington, for example, by himself and his land agent Crawford, had surveyed 70,000 acres and secured patents in his own and other officers' names for 63,000, of which his own share was 32,000. Dunmore began to give these warrants on his own responsibility as early as July 1773, and on 21 Jan. 1774 notified all gentlemen, officers and soldiers to have their surveyors assemble at the mouth of the Great Kanawha River and proceed to survey their claims. The land agents and surveyors who went down the river were stopped and in some cases attacked by the Indians, and this was one of the agencies in bringing about Dunmore's War, although trouble had been brewing for a long period owing to white settlement and Indian murders. The name «bounty lands» has been defined as pertaining to the Northwest Territory lands belonging to the States, because on 16 Sept. 1776 Congress offered land bounties to volunteers in the Revolution (assessing the money to buy them on the several States, to which Maryland objected because the other States had lands and she had none, and so would be unfairly taxed); but it does not appear that the phrase was ever used of them at the time.

When Virginia ceded her claims to the Northwest Territory, a large tract north of the Ohio River was reserved, and the present land titles in that section date back to the beginning of bounty lands. Besides the gifts from the States the Revolutionary soldiers were granted bounties of land by the Federal government. Four million acres of bounty lands were given to the soldiers of the War of 1812, while Congress, by the laws of 1847, 1850, 1852 and 1855, recognized the claims of survivors of the Mexican and Indian wars, 58,652,450 acres under 530,203 warrants being granted prior to 1883. Under the act of 1862 land scrip worth $1.25 per acre was distributed for 9,600,000 acres. Under the provisions of the Homestead Act land was given not only to civilians but also to soldiers, the latter being given the more advantageous terms, while it is possible even now for a soldier's widow to secure homestead land on a shorter residence than other people. Much of the early bounty land was located by scrip which was transferable, thus making it a more attractive investment for land buyers and speculators, because they could seek out the more valuable tracts. Revolutionary soldiers formed the Ohio Company of 1788, but they purchased their lands outright with evidences of public debt. The Federal government has steadily pursued a policy of divesting itself of the public land, but there are many forest reserves and national parks that will be permanent. See PUBLIC DOMAIN; LANDS, PUBLIC; HOMESTEAD AND LAND LAWS, etc.

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BOUNTIFUL, Utah, city in Utah County, 10 miles north of Salt Lake City and seven miles south of the county seat, on the Salt Lake and Ogden and the Utah Light and Traction Company electric lines and one mile east of the Oregon Short Line and the Denver and Rio Grande railroads. Truck gardening, dairying and brick making are the principal industries. Its two banks have combined resources amounting to $700,000, and its taxable property is valued at $600,000. The city has a post-office, opera house, three churches, a high school and two graded schools. The municipal receipts exceed $12,000 annually. The government is vested in a mayor and five councilmen. The recorder and treasurer are elected by popular vote, but the city attorney, justice and marshal hold appointive offices. Pop. 2,100.

BOUNTY-JUMPER, a term used during the Civil War in the United States to denote one who enlisted in the United States military service to secure the bounty paid by the government for volunteers, and then deserted. Some of these enterprising individuals carried on a regular business of enlisting in one place under a certain name, hurrying to the front, receiving the bounty, deserting at once upon its receipt and reappearing in some other place under a different name, only to re-enlist and repeat the process. The risks were great, but as the bounty was, in some cases, quite large, the practice found many votaries. Consult Wilkeson, ‘Recollections of a Private Soldier’ (New York 1887).

BOUNTY LANDS. See Bounties.

BOUNTY MUTINY. See Bligh, William.

BOUQUET, boo-kā, **Henry,** British officer in the French and Indian wars: b. Rolle, Switzerland 1719; d. Pensacola, Fla., 23 Aug. 1765. He entered the army of the States-General of Holland, then served in the Sardinian army against France and Spain but returned to the Dutch service in 1748 as an officer of the Swiss Guards. When war broke out between France and England in 1755 Bouquet was made lieutenant-colonel of an English regiment known as the Royal Americans. He reached Philadelphia in 1756 and in 1757 was ordered to Charleston with a small detachment of his regiment; but in 1758 returned to Pennsylvania and was made second in command of an expedition against Fort Duquesne in which George Washington also took part. The French deserted and set fire to the fort before the expedition reached there. This gave the control of Pennsylvania to the English, but Bouquet remained in the province, mostly at outlying posts. In 1763 the Indians united in an attempt to expel the English; they massacred many settlers, coming within a few miles of Lancaster, and blockaded Fort Pitt. There was no time to raise provincial troops if the fort was to be saved, so Bouquet set out with a force of 500 regulars, made his way through the forest, taking every precaution against surprise, and defeated the Indians at Bushy Run, within 20 miles of Fort Pitt. The number of the Indians that attacked him was as great as his own force, and his soldiers had never seen Indian warfare, but by skilfully feigning a retreat Bouquet drew the Indians from their cover and completely routed them by a sudden charge. In the following year he led a force of regulars and provincial troops to the forks of the Muskingum River, 150 miles west of Pittsburgh. The Indians, overawed by his former victory and by his boldness in penetrating so far into the wilderness, were ready to make peace and surrender their white prisoners. He was subsequently made brigadier-general and commandant of the Southern Colonies of British America and went to Pensacola where he died. Consult Parkman, ‘Conspiracy of Pontiac’ (Boston 1867); *Pennsylvania Magazine of History and Biography* (Vol. III, Philadelphia).

BOUQUET DE LA GRYE, boo-kā-dė-lạ-gre′, **Jean Jacques Anatole,** French hydrographical engineer: b. Thiers, Puy-de-Dôme, 20 May 1827; d. 1909. He studied at the Polytechnic School, whence he was graduated in 1847 in the hydrographical engineers, and in 1866 he became their engineer-in-chief. He became a member of the Institute; commander of the Legion of Honor and a member of the Academy, elected in 1884. He was also a member of the bureau of longitudes and vice-president of the committee on hydrography. A project which he had long urged was to make Paris a seaport by means of a ship-canal up the Seine. He is also known as an inventor and improver of astronomical instruments. He wrote ‘Paris as a Seaport’; ‘Notes on Soundings of the Sea’; ‘A Hydrographic Study on the Bay of Rochelle,’ etc.

BOUQUET OF WINE, a pleasant, non-spirituous aroma characteristic of good wines, and named on account of its real or fancied resemblance to the odor of flowers and fruits. The precise chemical nature of the substances that give rise to the «bouquet» is not known. They consist partly, without doubt, of a mixture of compound ethers, derived from fatty acids that are produced by the oxidation of albuminous substances and vegetable fats or oils. Essential oils of various kinds must also be included among them. According to some authorities, the kind of yeast that is used in the fermentation has much to do with the bouquet that is developed. Fruit blossoms are occasionally added to the must on account of the «ferment oil» that is developed by their fermentation, and which communicates a fruity smell to the wine. Elder flowers, when added to the must in this way, give rise to an aroma of Muscatel bouquet.

BOUQUETIN, boo-k’tāṅ′, a wild goat of the Alps and Pyrenees. See Ibex.

BOURASSA, Henri, French-Canadian Nationalist and journalist, the son of Napoléon Bourassa (q.v.): b. Montreal, 1 Sept. 1868. He sat for Labelle in the Dominion House of Commons 1896–1907, and has been a member of the Quebec provincial legislature from 1907–11. He was called to the bar in 1899, and is the founder and editor-in-chief of *Le Devoir,* a newspaper devoted to the furtherance of French-Canadian interests. He organized a campaign in 1910 against the Naval Service Bill of the Laurier administration. Both in the press and on the platform he is considered to be the most brillian exponent of the French Nationalist position, and on this subject he has written several pamphlets.

BOURASSA, Napoléon, French-Canadian author and architect: b. L’Acadie, Quebec, 21 Oct. 1827; studied art at Quebec and Toronto and also at Florence and Rome; a conspicuous example of his architectural work is the church of Notre Dame de Lourdes, Montreal. He is the author of ‘Jacques et Marie,’ ‘Nos Grand’ Mères’ and several volumes of lectures.

BOURBAKI, boor-bạ-kẹ, **Charles Denis Sauter,** French general: b. Pau, 22 April 1816; d. Bayonne, 22 Sept. 1897. He entered the army in 1836, served for some time in Algeria and rose to the rank of brigadier-general in 1854. He fought in the Crimea where he won distinction at the Alma, the Inkerman and in the assault on Sebastopol, and also participated in the Italian campaign of 1859. In 1870 he commanded the Imperial Guard at Metz, whence he was sent to England on a secret mission to the Empress. Under Gambetta he organized the Army of the North and commanded the Army of the Loire. His attempt to break the Prussian line at Belfort, though ably conceived, ended in disastrous failure; in a series of desultory attacks on a much inferior force, 15–17 Jan. 1871, he lost 10,000 men. In the wretched retreat to Switzerland that followed on the 27th, reduced to despair by the ill success of his plans, he attempted to commit suicide. From 1873 to 1879 he commanded the 14th Army Corps at Lyons, and in 1881 he retired from service. Consult Grandin, 'Le général Bourbaki' (Paris 1897).

BOURBON, Antoine de (DUKE OF VENDÔME, and afterward KING OF NAVARRE): b. 22 April 1518; d. 17 Nov. 1562. He married, in 1548, Jeanne d'Albret, only child of Henry II, King of Navarre, and assumed the title of king in her right. After the accession to the throne of France of the young King Francis II, he endeavored to obtain the control of the affairs of that country, but failed through his want of energy and perseverance. On the death of Francis II, in 1560, he was made lieutenant-general of the kingdom and adviser to the Queen-mother (Catherine de Medici) during minority of her son after that; he definitely embraced Catholicism. Upon the breaking out of the civil war, in 1562, he commanded the royal forces, and died of a wound received at the siege of Rouen. His son, Henry of Navarre, became King of France, as Henry IV (1594).

BOURBON, Charles (DUKE OF BOURBONNAIS), French general known as CONSTABLE DE BOURBON; son of Gilbert, Count of Montpensier and Clara of Gonzaga: b. 17 Feb. 1489; d. 6 May 1527. He received from Francis I, in the 26th year of his age, the sword of Constable. By the coolness with which he faced death in posts of the greatest hazard he excited the admiration of his fellow-soldiers. When viceroy of Milan he won all hearts by his frankness and affability. His fame was not yet tarnished when the injustice of his king deprived him of his offices, banished him from France and brought the family of Bourbon into disgrace, in which state it continued until the conclusion of the reign of Henry III. Whatever may be the true cause of her conduct, it is certain that the Duchess of Angoulême, mother of Francis I, strove to invalidate a formal donation of Louis XII. The Constable, enraged at seeing himself deprived of his estates by the mother of the king whom he had served with so much fidelity and zeal, listened to proposals made him by Charles V and the king of England. He experienced the usual fate of deserters; he was well received while his services were needed, but narrowly watched to secure his fidelity. Exposed as he was to the contempt of the Spanish nobility and the jealousy of the generals of Charles V, nothing remained to him but his courage and repentance. His ability, however, induced the emperor to bestow upon him the command of an army, and to treat him with honor. In 1523 Francis I sought an interview with him, and offered him restitution, but Bourbon doubted the good faith of the King and made his escape. His flight was a misfortune to France; the expedition of Francis into Italy was arrested. Having been appointed to the command of the imperial troops, he made an unsuccessful attack upon Marseilles, but contributed greatly to the victory of Pavia. When Francis was carried a prisoner to Madrid he went there in person, that he might not be forgotten in the treaties between the two monarchs; but Charles V delayed concluding them, and Bourbon discovered that he could not trust the Emperor, who had even promised him his sister in marriage. Compelled to smother his resentment, he returned to Milan, maintained possession of Italy by the terror of his arms, and obtained so much authority as to become an object of suspicion to the Emperor, who, in order to weaken him, refused to grant him the necessary supplies. In order to prevent the dispersion of his army he led the soldiers to the siege of Rome, the plunder of which city he promised them. He was the first to mount the breach, and was killed by a ball, shot, it is said, by Benvenuto Cellini. His body being conveyed to Gaeta, his soldiers erected over it a splendid monument, afterward destroyed. Consult Coignet, 'Francis the First and His Times' (London 1888); Hare, 'Charles de Bourbon, Constable of France' (ib. 1910).

BOURBON, Louis, Spanish prelate: b. 1777; d. 19 March 1823. He was the son of Louis, brother of King Charles III of Spain, and the Duchess of Chinchon. The marriage was concluded with the royal assent; nevertheless, it was doubted, after the death of Charles III, whether the prince would be lawful heir to the throne, if a male descendant of the old line should be wanting. He therefore entered the Church, was appointed archbishop of Seville in 1799, and of Toledo in 1800. A cardinal's hat was also given him in 1800. After the imprisonment of Ferdinand VII at Valençay, he joined the party of the Cortes, and became very influential. He offered, in 1814, the constitution of the Cortes to Ferdinand VII for his signature; and the King having altered his determination, Bourbon lost favor. After the events which took place on the insurrection of the army at the island of Leon, he engaged in the revolution, and was president of the provisional junta before which the King swore, at Madrid, 9 March 1820, to abide by the constitution of the Cortes of 1812.

BOURBON, Louis Henri (DUC DE), French courtier, Prince of Condé: b. Versailles 1692; d. Chantilly, 27 Jan. 1740. As chief of the Council of Regency and superintendent of the king's education, he robbed the public treasury and extorted huge bribes. Made prime minister in 1723, he persecuted the Protestants and granted exorbitant privileges to the India Company, in which he held shares. He was entirely controlled by his mistress, the Marquise de Prie.

BOURBON, Isle of. See RÉUNION, ISLE DE LA.

BOURBON (bọr-bôṅ) **FAMILY.** The founder of this family, which has governed France, Spain, the two Sicilies, Lucca and Parma, was Robert the Strong, who, in 861, became Duke of Neustria and in 866 lost his life in a battle against the Normans. Some trace his descent from Pepin l'Heristal, others from a natural son of Charlemagne and others from the kings of Lombardy. It is certain that the two sons of this Robert were kings of France. The elder, named Eudes, ascended the throne in 888 and died in 898; the younger, Robert, in 922 and died in 923. The eldest son of this Robert was Hugh the Great, Duke of the Isle of France and Count of Paris and Orleans. Hugh Capet, son of Hugh the Great (great grandson of Robert the Strong), founded the 3d French dynasty in 987. One of his descendants, named Robert, was the root of the elder line of the dukes of Burgundy, which became extinct in 1361. A descendant of this Robert, Henry of Burgundy, was first regent of Portugal in 1095, where his legitimate descendants became extinct in 1383. Pierre de Courtenay, a descendant of Hugh Capet, in the fifth generation, was father and ancestor of many emperors of Constantinople. The house of Anjou descended from Hugh Capet, in the eighth generation, possessed the throne of Naples for two centuries and for some time that of Hungary. Another descendant of Hugh Capet, in the 10th degree, founded the house of Navarre, which continued from 1328 to 1425. A second family of Anjou, descended from Hugh Capet, in the 13th degree, gave some distinguished princes to Provence. In the same degree, the younger line of the powerful dukes of Burgundy derived its origin from him. This line became extinct with the death of Charles the Bold, in 1477, whose successor, Maria, married Maximilian, Archduke of Austria, and became grandmother of Charles V. Robert, Earl of Clermont, second son of Saint Louis, married Beatrice, Duchess of Bourbon. In this way the city of Bourbon l'Archambault, or Bourbon les Bains, in the department of Allier (formerly Bourbonnais), became the birthplace of the house of Bourbon and Louis I, Duke of Bourbon, son of Robert and Beatrice, its founder. Two branches took their origin from the two sons of this Louis, Duke of Bourbon, who died in 1341. The elder line was that of the dukes of Bourbon, which became extinct at the death of the Constable of Bourbon in 1527, in the assault of the city of Rome. The younger was that of the counts of La Marche, afterward counts and dukes of Vendôme. Of these, Charles, Duke of Vendôme, who died in 1537 and who had been the head of the house of Bourbon since the death of the Constable, had two sons, Anthony and Louis, founders respectively of the royal line of Bourbon and of the line of Condé. Henry, the son of Anthony, obtained the throne of France as Henry IV, when the house of Valois became extinct in 1589 by the murder of Henry III. His father had obtained the kingdom of Navarre through his wife, who inherited it, and Henry now added it to the French dominions. Anthony's younger brother Louis, Prince of Condé, was the founder of the line of Condé. There were, therefore, two chief branches of the Bourbons — the royal and that of Condé. The royal branch was divided by the two sons of Louis XIII, the elder of whom, Louis XIV, continued the chief branch, which, through his son, Louis (the Dauphin), and grandson, Philip V, was separated into the elder or royal French branch and the younger or royal Spanish branch; while Philip, younger son of Louis XIII, founded the house of Orleans, when he received the duchy of Orleans from Louis XIV. The kings of the elder or French line of the house of Bourbon are as follows: Henry IV, Louis XIII, XIV, XV, XVI, XVII, XVIII and Charles X. The house of Bourbon consists of the following branches and members:

The Elder French Royal Line of Bourbons as Distinguished from the Younger Branch or House of Orleans.— The last sovereigns of this line were three brothers, Louis XVI, Louis XVIII and Charles X (Louis XVII, son of Louis XVI, never obtained the crown), all of whom were grandsons of Louis XV. Louis XVIII had no children, but Charles X had two sons, namely: Louis Antoine de Bourbon, Duke of Angoulême, who was Dauphin till the revolution of 1830 and died without issue in 1844, and Charles Ferdinand, Duke of Berry, who died 14 Feb. 1820, of a wound given him by a political fanatic. The Duke of Berry had two children, (1) Louise Marie Thérèse, called Mademoiselle d'Artois, and afterward by marriage Duchess of Parma, died at Venice, 1 Feb. 1864; and (2) Henri Charles Ferdinand Marie Dieudonné, born in 1820, and at first called Duke of Bordeaux, but afterward Count de Chambord. His mother was the Princess Caroline, daughter of Francis I, King of the two Sicilies. Charles X, having abdicated in favor of his grandson Henri, above mentioned, in 1830, and the Dauphin having renounced his claims on the French throne also in favor of the latter, the Count de Chambord was until his death in 1883 looked upon by his party as the legitimate heir to the crown of France, and was styled by them Henri V.

The Branch of the Bourbons Known as the House of Orleans.— This branch raised to the throne of France by the revolution of 1830, and deprived of it by that of 1848, derives its origin, as already mentioned, from Duke Philip I of Orleans (d. 1701), second son of Louis XIII, and only brother of Louis XIV. By his second wife, Charlotte of the Palatinate, he left as his successor in the dukedom his son Philip, known as Duke of Chartres during his father's lifetime, and was regent of France during the minority of Louis XV. Philip, second duke, was succeeded by his son, Louis Philip (b. 1703), who married a princess of Baden and died in retirement in 1752, leaving a son of the same name, Louis Philip, Duke of Orleans, who was born in 1725 and died in 1785. The son of the last-mentioned duke was Louis Joseph Philip, the Duke of Orleans, whose name figures in the first French revolution, who perished on the scaffold in 1793, after he had laid aside his princely name the year before and assumed that of "Citizen Egalité." He left four children: (1) Louis Philip, before the revolution Duke of Chartres, after his father's death Duke of Orleans, from 1830 to 1848 King of France, died 26 Aug. 1850, leaving a numerous family; (2) the Duke of Montpensier, who died in England in 1807; (3) the Count de Beaujolais, who died at Malta in 1808; and (4) a daughter, Adelaide, Mademoiselle d'Orleans, born in 1777, died 31 Dec. 1847. The eldest son of King Louis Philip was Ferdinand, Duke of Orleans (b. 1810, d. 1842), who married a daughter of Frederick Louis of Mecklenburg-Schwerin and left two sons: (1) Louis Philip, Count de Paris, b. Paris, 24 Aug. 1838; and (2) Robert, Duke of Chartres, b. Paris 1840. Louis Philip having abdicated in favor of the former in 1848, the Comte de Paris till his death in 1894 was looked upon by the Orleanists as the true heir to the throne. He was married to his cousin, Isabella, a daughter of the Duke of Montpensier, and left issue. His son, the Duke of Orleans, is now regarded by the Monarchists as the legitimate heir to the throne.

The Spanish-Bourbon Dynasty.— In 1700 Louis XIV placed his grandson Philip, Duke of Anjou, on the Spanish throne, who as Philip V founded the Bourbon dynasty in Spain. Philip V was succeeded in 1746 by his son, Ferdinand VI, who, dying in 1759 without heirs, was succeeded by his brother, Charles III. To him succeeded (1788) his son Charles IV, who, in 1808, resigned the throne in favor of a successor nominated by Napoleon, and died at Naples in 1819. His son Fernando, Prince of the Asturias, obtained the crown on the fall of Napoleon and reigned as Ferdinand VII, dying 29 Sept. 1833, and leaving behind him two daughters by his third marriage, the elder of whom succeeded him as Isabella II. She was married, in 1846, to her cousin Francisco de Assis. In 1868 she had to leave Spain in consequence of the revolution, and in 1870 she renounced her claims to the throne in favor of her son Alphonso, who became Alphonso XII, and died in 1885, his son, Alphonso XIII, succeeding him.

The Royal Line of the Two Sicilies.— The Two Sicilies being then a possession of the Spanish monarchy, in 1735 Don Carlos, the younger son of Philip V of Spain, obtained the crown and reigned over Sicily and Naples as Charles III. In 1759, however, he succeeded his brother Ferdinand VI on the Spanish throne when he transferred the Two Sicilies to his third son Fernando (Ferdinand IV), on the express condition that this crown should not be again united with Spain. Ferdinand IV had to leave Naples in 1806; but after the fall of Napoleon he again became king of both Sicilies under the title of Ferdinand I. He was succeeded by his son Francis I in 1825; Francis was succeeded by his son Ferdinand II in 1830; and the latter was succeeded by his son Francis II in 1859, who was deprived of the kingdom in 1860.

The Ducal Line of Parma.— This line, like that of the Two Sicilies, was founded by a son of Philip V of Spain, namely: Don Philip, his youngest son, who obtained the duchies of Parma and Piacenza in 1748. Louis, grandson of Don Philip, obtained Tuscany likewise (1802), with the title of King of Etruria. The family did not long retain this honor, however, being soon forced by the power of France to give up not only Etruria, but also Parma and Piacenza; and it was not till 1847 that there was again a Bourbon Duke of Parma. In 1859 the reigning Duke, Robert, had to leave his dominions, which were soon incorporated in the kingdom of Italy. Consult Coiffier Demoret, ‹Histoire du Bourbonnais et des Bourbons› (1824); Achaintre, ‹Histoire Chronologique et Généalogique de la Maison Royale de Bourbon› (1825); Coxe, ‹Memoirs of the Kings of Spain of the House of Bourbon› (1815); Lehes, ‹Généalogie des Bourbons de France, d'Espagne, de Naples, et de Parme› (1880); Bingham, ‹The Marriages of the Bourbons› (1890); Dussieux, ‹Généalogie de la Maison de Bourbon de 1256 à 1869› (Paris 1869); Stenger, ‹Le Retour des Bourbons› (Paris 1908).

BOURBON-LANCY, läṅ-sẹ, French watering place, department Saône-et-Loire, 52 miles south-southeast of Nevers by rail, famous for its thermal springs, containing chloride of sodium and iron. Its situation is notably fine, and by the Romans it was called Aquæ Nisineii or Nisienses. Remains of the Roman baths are still to be seen here, and the town contains a hospital, built by the Marquis d'Aligre, with 400 beds. Pop. 4,469.

BOURBON-VENDÉE. See ROCHE-SUR-YON-LE.

BOURBON WHISKY, a term applied to Kentucky whisky made from a mixture of corn, rye and malt, of which the corn constitutes the larger part. In its distillation some of the oils and acids are allowed to remain. These, with age, undergo chemical action and are converted into aromatic ethers.

BOURBONNAIS, boor-bôn-nā', France, a province and government of old France, with the title, first of a county and afterward of a duchy, lying between the Nivernais, Berry and Burgundy. It now forms the departments of Allier, Cher and Nièvre. It derived its name from the small town Bourbon l'Archambault, from which the Bourbon family received their title. It formed the duchy of Bourbon for 200 years after 1327, and at the end of that period was annexed by the Crown. In 1661 the king gave it to the noble house of Bourbon-Condé, from whom it was taken at the Revolution. Consult Montegut, ‹En Bourbonnais et en Forez› (1880); Mauve, ‹Le Bourbonnais sous la Seconde République› (1909).

BOURBONNAIS, Ill., village in Kankakee County, 56 miles south of Chicago, the seat of two important Roman Catholic schools, Notre Dame Academy and Saint Viateur's College, opened in 1865. Pop. 611.

BOURBONNE-LES-BAINS, boor-bŭn-lā-bān, a town of France, department of Haute Marne, 21 miles east-northeast of Langres, with hot springs, which were resorted to by the Romans. They contain much chloride of sodium, with a temperature which varies from 140° to 150° F., and frequented by some 3,000 invalids annually. The town has a 12th-century church, a large military hospital and interesting ruins of an ancient château. Saw and plaster mills represent the town's principal industries. Pop. 3,707.

BOURBOULE, boor-bool, **La**, France, a health resort in the department of Puy-le-Dôme, 22 miles southwest of Clermont. It is picturesquely situated amid striking scenery and its mineral thermal springs are visited by over 7,000 persons yearly. Its waters when bottled are extensively exported for medicinal use. Pop. 1,314.

BOURCHIER, boor'chĭ-ėr, **Arthur**, English actor: b. Speen, Berkshire, 22 June 1864. He is a graduate of Oxford University, where he was prominent in amateur theatricals, and in 1889 went upon the stage. He has played in leading theatres in England and the United States and took the Royalty Theatre, London, in 1895, when he brought out one of his own adaptations, ‹The Chili Widow,› which ran 300 nights, and the Garrick Theatre in 1900, where he produced Barrie's play, ‹The Wedding Guest.› In 1910 he joined Sir Herbert Tree at His Majesty's Theatre, where they produced some important and highly successful Shakespearean revivals. Since then he has toured with his own company. In 1894 Mr. Bourchier married Miss Violet Vanbrugh, a talented actress, who has since been generally associated with him as leading lady.

BOURDALOUE, boor-dạ-loo, **Louis,** the founder of genuine pulpit eloquence in France: b. Bourges, 20 Aug. 1632; d. Paris, 13 May 1704. He was 16 when he entered the Society of Jesus, and his instructors successively entrusted to him the chairs of polite letters, rhetoric, philosophy and moral theology. In 1669 he entered the pulpit and extended his reputation by attacking, with a powerful and religious eloquence, the passions, vices and errors of mankind. The dignity of his delivery and the fire of his language made him distinguished, even among the master-spirits of the arts and of literature in the time of Corneille and Racine. Louis XIV invited him, in 1670, to preach before the court, and Bourdaloue acquitted himself with so much acceptance that he afterward received invitations at 10 different times. After the repeal of the Edict of Nantes, he was sent to Languedoc in order to explain to the Protestants the doctrines of the Roman Catholic faith, with a view to winning them over, and in this delicate mission he showed remarkable address, and he succeeded in this difficult business in reconciling the dignity of his office with the rights of mankind. In his latter days he devoted himself to the care of hospitals, prisons and religious institutions. He well knew how to accommodate his manner to the capacity of those to whom he gave instruction, advice or consolation. Beloved alike by men of diverse creeds and classes, he exercised authority over the minds of all, and no consideration could make him give up his openness and integrity of character. His ‹Sermons and Moral Discourses› appeared in English (3d ed., 1855), and ‹Married Life: Its Obligations and Trials› (1897). Consult Anatole Feugère, ‹Bourdaloue, sa prédication et son temps› (1874); J. B. E. Tousserat, ‹Etude généalogique sur les Bourdaloue› (1900).

BOURDILLON, Francis William, English poet: b. 22 March 1852. He has taught private pupils for many years and as a poet is widely known as the author of the lyric, ‹The Night Has a Thousand Eyes.› His published works include ‹Among the Flowers› (1878); ‹Aucassin and Nicolette,› edited and translated (1887); ‹Ailes d'Alouette› (1890); ‹A Lost God› (1891); ‹Sursum Corda›; ‹Nephelé,› a much admired musical romance (1869); ‹Minuscula› (1897); ‹Through the Gateway› (1902); and ‹Preludes and Romances› (1908).

BOURDON, boor'dôṅ, **Sébastien,** celebrated French painter: b. Montpellier 1616; d. 1671. Being poor and without occupation, he enlisted as a soldier. After receiving his dismissal, he visited Italy and studied under Poussin and Claude Lorraine. After his return to Paris, he firmly established his reputation by his ‹Martyrdom of Saint Peter› (Louvre Gallery) and became one of the 10 original members and rector of the Academy of Painting. In 1652, driven from France by the religious troubles, he was appointed first painter to Queen Christina of Sweden. He afterward became distinguished in his own country by many great works, among which are the following: The ‹Descent from the Cross,› the ‹Old Kings of Burgundy in the Senate-house at Aix,› the ‹Adulteress.› As an artist his conception is good and his view far-reaching, but he lacks in brilliancy of coloring effects. He was a good engraver on copper. He died while engaged in painting the ceiling of the Tuileries.

BOURDON, named after the inventor, a barometer consisting of an elastic flattened tube of metal bent to a circular form and exhausted of air, so that the ends of the tube separate as the atmospheric pressure is diminished and approach as it increases. The Bourdon is commonly known as the metallic barometer, although the aneroid is also metallic and both holosteric.

BOURDON DE L'OISE, lwäz, **François Louis,** French revolutionist: b. Saint Remy, about 1750; d. Cayenne, Guiana, after 1797. He figured in the attack on the Tuileries, 10 Aug. 1792, and did much to bring to pass the execution of the king and the fall of the Girondists, but from July 1794 adopted the side of the nobles and clergy. In 1795 he was sent as a commissioner to Chartres, where he behaved harshly and brutally. After joining a Royalist club, he was proscribed and transported to Cayenne in 1797, where he died not long after.

BOURG-EN-BRESSE, boorg-äṅ-brĕs, France, town, capital of the department of Ain, situated 232 miles southeast of Paris, on the Reyssouse and the Cône. It is well built and ornamented with public fountains, one of which was erected to the memory of General Joubert. The streets are narrow and clean. On the Promenade du Bastion is a bronze statue of Bichat, the celebrated anatomist, who pursued his early medical studies in the hospital here. The parish church of Bourg-en-Bresse is a handsome edifice of the 16th century. Outside the town is a magnificent hospital, surrounded by gardens, and the beautiful Gothic church of Brou, built by the direction of Margaret of Austria, daughter of Maximilian I. In front of the portal stands a curious elliptical sun-dial, reconstructed by the celebrated astronomer Lalande, who was a native of this place. Bourg-en-Bresse has a library, a museum, a lyceum, seminary, two hospitals, a lunatic asylum, some manufactories of linen and hosiery, tanneries, a cotton mill, grain market, etc. Its trade in grain, cattle, horses and wine is considerable. Pop. 20,545. Consult Charvet, ‹Les Édifices de Brou à Bourg-en-Bresse› (1897).

BOURGAULT-DUCOUDRAY, boor'gō'-du'-koo'dra', **Louis Albert,** French musical critic and composer: b. Nantes, 2 Feb. 1840; d. July 1910. He became a lawyer, but with a talent for music studied composition under A. Thomas at the Paris Conservatory. With his cantata, ‹Louise de Mezières,› he won the Prix de Rome in 1865 and took the three years' study and travel course in Italy. In 1868, on his return to Paris, he founded a choral society to sing the works of older masters. His visit to Greece in 1872 to study the music of the Greek Church resulted in the publication of ‹Souvenirs d'une mission musicale en Grèce,› ‹Trente mélodies populaires de Grèce et d'Orient› and ‹Etudes sur la musique ecclésiastique grecque.› He became professor of the history of music at the Paris Conservatory in 1878. Among his works are the comic operas ‘L'atelier de Prague’ 1858; ‘Michel Colomb’ (1887); ‘Thamara,’ a grand opera (1891); a ‘Stabat Mater’; choral works with orchestra, and orchestral compositions.

BOURGELAT, boorzh'lạ **Claude,** French lawyer, founder of the veterinary schools and creator of the art of veterinary surgery in France: b. Lyons 1712; d. 3 Jan. 1779. He established the first veterinary school in his native town in 1762 and by his works on the veterinary art furnished the world with a complete course of instruction both in its theory and in its practice; they include ‘Eléments d'hippiatrique, ou nouveaux principes sur la connaissance et sur la médecine des chevaux’ (1750–53) and ‘Traité de la conformation extérieure du cheval’ (1776); ‘Réglement sur les écoles vétérinaires de France’ (1777).

BOURGEOIS, boor-zhwä, **Charles Arthur,** Baron, French sculptor: b. 1838; d. 1886. He was a student of Duret and M. Guillaume. Among the more notable of his works are the ‘Arab Washerwoman’; the ‘Greek Actor,’ in bronze; ‘Saint Agatha’; ‘The Slave’; ‘Hero and Leander,’ in plaster; ‘The Delphic Pythos’ and several busts in marble, ‘Saint Joachim’ and ‘Religion,’ two stone figures for the church of Saint Eustace and the church of the Sorbonne, respectively.

BOURGEOIS, Leon Victor Auguste, French politician: b. Paris, 29 May 1851. After holding several positions of importance, he became director of the ministry of the interior in 1886 and in 1887 prefect of police. He was minister of the interior in 1889, minister of public instruction 1892–93 and prime minister 1895–96. He was for a time in 1898 Minister of Public Instruction for the second time, and in 1899 was at the head of the French delegation to the peace conference at The Hague. In 1902–04 he was president of the Chamber of Deputies and in 1906 was appointed Minister of Foreign Affairs under Sarrien as premier. In 1907 he was again at the head of the French delegation at The Hague. M. Bourgeois represented France on the commission that drafted the Covenant of the League of Nations and was made first president of the Council of the League. In 1920 he became president of the French Senate.

BOURGEOIS, Sir **Peter Francis,** English painter: b. London 1756; d. 8 Jan. 1811. He is said to have descended from a family of some importance in Switzerland. The father intended the boy for a military career, but he was determined to be an artist. In this he was encouraged by Reynolds and Gainsborough. Under the tuition of De Loutherbourg he early acquired a reputation as a landscape painter. Between 1779 and 1810 he exhibited 103 pictures in the Royal Academy. In 1787 he was elected associate and, in 1793, full member of the Royal Academy. King Stanislaus of Poland appointed him court painter and conferred upon him the honor of Knight of the Order of Merit in 1791, and George III made him his own personal landscape painter in 1794 and, about the same time, knighted him. Bourgeois lived with Joseph Desenfans, a picture dealer with wide connections, who was employed by Stanislaus to collect for him works of art, the greater part of which ultimately remained on his hands. These were left by will to Bourgeois, who added to the collection, which is now known as the Dulwich Gallery, which had its origin in a bequest of 371 pictures made by Bourgeois to Dulwich College. With this bequest went £12,000 for the maintenance of the collection and the repair of a wing of the college. Mrs. Desenfans and the college authorities added a like sum and a new building was erected, in which was a mausoleum erected to the memory of Bourgeois. Though pre-eminently a landscape painter, Bourgeois also has left a number of historical paintings and numerous portraits.

BOURGEOIS, bŭr-jois′, a size of printing type between brevier and long primer.

BOURGEOISIE, boor-zhwä-zẹ (derived from *bourg,* a town), a name applied in France to citizens of towns who do not belong to the nobility or clergy, and in a narrower sense to townspeople occupying an independent position — merchants, tradesmen, independent artisans, lawyers, etc. In the early period of the Middle Ages this class was much oppressed and, as a consequence, it was poor and possessed little culture and refinement. In subsequent centuries it succeeded in raising itself in all these respects; and latterly, attaining a position of political equality with the nobility and clergy, came to be spoken of as the “third estate” (*tiers état*). The word is now used in a somewhat vaguer sense than formerly and may be taken to correspond with the equally vague English appellation the “middle classes.” The adjective signification of the word has, at the hands of some modern writers, come to signify a more or less unthinking conservatism. Bourgeois is also used in the sense of a civilian, or one not a soldier, of a master, a burgess or a shipowner. The form *bourgeoisie* is generally used for citizenship, commonalty and, in a political sense, for the freedom of a city. Bourgeois also has the sense of rustic, as opposed to the polish of court society.

BOURGEOYS, Marguerite, French religious teacher: b. Troyes, 17 April 1620; d. 12 Jan. 1700. In 1653, at the suggestion of Paul de Maisonneuve, she went to Canada to engage in teaching and opened the first school in Montreal in 1657. In 1659 she founded the Congregation of Notre Dame.

BOURGES, boorzh, France, capital of the department of Cher, 124 miles south of Paris, on the canal of Berry and the Central Railroad, in an extensive plain at the confluence of the Auron and the Yévrette. When the Romans invaded Gaul it was known as Avaricum, the capital of Biturigescubi. It was taken by Cæsar, 52 b.c., and almost all its inhabitants slaughtered. Under the name of Bituriges, it was for 475 years the metropolis of Aquitania. During the Middle Ages many councils were held here. The French clergy assembled here in 1438 to receive the famous charter known as the Pragmatic Sanction, by which the liberties of the Gallican Church were secured. Jacques Cœur and Louis XI were both born here. The former established here in 1463 a university, where Cujas taught during the 16th century. It was abolished in the Revolution. Bourdaloue, the famous preacher, was born here in 1632. Don Carlos resided here from 1839 to 1845, when he signed the abdication in favor of his son. The trial of Louis Blanc, Albert and others took place before the Supreme Court at Bourges, 7 March to 2 April 1849. The city is partly surrounded by a thick wall, flanked with lofty towers; its streets are irregularly laid out, while the houses are generally mean-looking, with their gables to the street. Among the old buildings which it contains are the magnificent cathedral, larger than Notre Dame de Paris, and one of the finest Gothic monuments of Europe; the city hall, built at great cost by Jacques Cœur as a dwelling-house and now occupied as the Palais de Justice; and the palace of the archbishop. The establishments of public instruction, including the imperial college, the theological seminary and the normal school, are well patronized. Bourges has manufactories of fine and coarse cloths, iron foundries and tan-yards. Government gun and powder works add much to its prosperity. It has a large trade in wine, grain, cloth, cattle, hemp and millstones. Consult Archelet, ‘Au pays de Jacques Cœur: Bourges’ (1909). Pop. about 45,000.

BOURGET, boor-zhā′ **Ignace,** Canadian clergyman: b. 1799; d. 1885. He was Roman Catholic bishop of Montreal, 1840–76. His condemnation of the ‘Year Book’ of the Institut Canadien in 1868 on account of its liberalizing tendencies, and his subsequent refusal of Christian burial to Joseph Guibord, a member of the Institut, gave rise to a *cause célèbre* which was only finally decided on appeal to the British Privy Council.

BOURGET, Paul, French novelist: b. Amiens, 2 Sept. 1852. After a brilliant course at the Lyceum of Clermont-Ferrand, where his father was professor of mathematics, and the College of Sainte Barbe, he graduated with high honors in 1872. He began to write in 1873, but it was 10 years before he found his true work, though he contributed, the while, numerous articles to the magazines and published three volumes of striking verse, ‘La Vie Inquiète’ (1875); ‘Edel’ (1878); and ‘Les Aveux’ (1881). His ‘Essais’ (1883) was the first indication of his strength. The second series, ‘Nouveaux essais de psychologie contemporaine’ (1886), was a singularly subtle and exceedingly searching inquiry into the causes of the pessimism then widely prevalent in France. Bourget’s first novel, ‘L’irréparable’ (1884), was followed by ‘Cruelle enigme’ (1885); ‘Un crime d’amour’ (1886); ‘André Cornelis’ (1887), and ‘Mensonges’ (1887). The keen insight into the hidden springs of human motive and the marvelous subtlety of psychological analysis of these stories, together with their clearness and refinement of style, have lifted Bourget into the front rank of contemporary French novelists. His intimate knowledge of English and Latin life, and his travels in Spain and Morocco, gave him the material for ‘Sensations d’Italie’ (1891), and ‘Cosmopolis’ (1892); and he recorded his impressions (1894) of travel in the United States. Other novels are ‘Le disciple,’ ‘Notre cœur,’ ‘La terre promise,’ ‘Un saint,’ ‘Antigone,’ ‘Drame de famille’ (1900); ‘Un homme d’affaires’ (1901); ‘Le fantôme’ (1901). Bourget was admitted to the Academy in 1894. Among other and later works of his are ‘L’emigré’ (1907); ‘L’envers du décor’ (1911); ‘La Crise’ and ‘Pages de critique et de doctrine’ (1912). Consult Giraud, ‘M. Paul Bourget’ (1911), and Plat, ‘Figures de ce temps’ (1913).

BOURGOIN, boor-gwäṅ, **France, town,** capital of a canton in the department Isère in southeastern France. It is situated on the river Bourbre and was called by the Romans Bergusium. It contains important paper, linen and woolen industries. Pop. 5,623.

BOURGOING, boor-gwäṅ, **Jean François,** French diplomatist: b. Nevers, 20 Nov. 1748; d. Carlsbad, 20 July 1811. While at a military school in Paris his talents were so marked that he was educated by the government at the University of Strassburg for the diplomatic service. After four years spent in Germany on diplomatic missions, he went to Madrid in 1777 and was secretary of legation there seven years, writing in that time his noted ‘Nouveau voyage en Espagne, ou tableau de l’état actuel de cette monarchie’ (1789). In 1791 he was Minister Plenipotentiary to Spain, Minister to Saxony in 1808, and was at various times employed on diplomatic missions to Germany and Holland. Besides the work above named he wrote ‘Mémoires historiques et philosophiques sur Pie VI’ (1789), and ‘Voyage du duc du Châtelet en Portugal’ (2 vols., 1808).

BOURIGNON, boo-rẹ-nyôṅ, **Antoinette,** Flemish visionary: b. Lille, 13 Jan. 1616; d. Franeker, 30 Oct. 1680. She was born so ugly that her parents held a consultation to determine whether it would not be better to destroy her as a monster. She was spared, but her infancy was spent in neglect and solitude. The first books she put her hands on were lives of early Christians and mystical tracts, which she read eagerly. She entered a convent and was subsequently in charge of a hospital at Lille, but was obliged to leave on account of her religious vagaries. She now traveled through various countries, her enthusiasm gaining for her many proselytes. She held that religion consists in internal emotion and is independent of knowledge or practice. Her views were adopted by large numbers of Protestants and Roman Catholics, and in the 17th and 18th centuries Scottish Presbyterian ministers were for a long time compelled to renounce Bourignianism at their ordination. Her works were edited by Poiret (19 vols., Amsterdam 1680–86; 2d ed., 1717). Several of her works have been translated in English, e.g., ‘Treatise of Solid Virtue’ (1699); ‘The Light of the World’ (1696, in English 1863); ‘Restoration of the Gospel Spirit’ (1707).

BOURINOT, boo′rẹ-nŏt, Sir **John George,** Canadian publicist: b. Sydney, Nova Scotia, 24 Oct. 1838; d. 14 Oct. 1902. He was educated at Trinity College, Toronto; founded and edited the Halifax *Reporter;* became clerk of the Dominion Parliament in 1880; in 1892 became president of the Royal Society of Canada, and was created K.C.M.G. in 1898. His publications include ‘The Intellectual Development of the Canadian People’ (1881); ‘Manual of Constitutional History’ (1888); ‘Parliamentary Government in Canada’ (1892); ‘Parliamentary Procedure and Practice’ (1884); ‘How Canada is Governed' (1895); 'Canada's Intellectual Strength and Weakness' (1893); 'Canada Under British Rule' (1900); 'Cape Breton and Its Memorials of the French Régime' (1892); 'Lord Elgin' (1903).

BOURMONT, boor-môn, **Louis Auguste Victor** (DE CHAISNES, COMTE DE), marshal of France: b. 2 Sept. 1773, at the castle of Bourmont in Anjou; d. there, 27 Oct. 1846. At an early age he took part in the campaign in La Vendée. Afterward he went to England as the envoy of the anti-revolutionary party. On the collapse of the Royalist struggle in La Vendée in 1799, Bourmont led a guerilla band, but was soon forced to surrender. He won Napoleon's favor but, becoming suspected of intrigue, was imprisoned at Besançon. He escaped to Lisbon, where Junot found him, and on his plighting his good faith he was again restored to favor and was advanced by Napoleon, under whom he had distinguished himself at Dresden and Nogent, to the rank of general of division. Bourmont switched his allegiance many times from Napoleon to the Bourbons and back again. Some years after, as commander of the army of intervention in Spain, he obtained some brilliant successes. His greatest victory was the conquest of Algiers, which procured him a marshal's staff in 1830. After the revolution of July 1830, he followed the banished dynasty into exile. In 1833, Dom Miguel, king of Portugal, placed him at the head of his troops which were to act against the adherents of Dom Pedro, but he was unsuccessful. He afterward sought to act in the interests of the Carlists in Spain, and when he at last returned to his native country, found that he had almost entirely lost his popularity and accordingly retired for the rest of his life to his estate in Anjou.

BOURNE, Edward Gaylord, American educator: b. Strykersville, N. Y., 24 June 1860; d. New Haven, Conn., 24 Feb. 1908. He was graduated at Yale in 1883 and was professor of history there from 1895. He wrote 'The History of Surplus Revenue of 1837,' was one of the editors of the *Yale Review* and published a collection of his writings on historical subjects under the title of 'Essays in Historical Criticism' (1901, 1913). Among his other works may be cited 'Historical Introduction to the Philippine Islands' (1903); 'Spain in America' (1904); 'Life of J. L. Motley' (1905); 'Discovery, History and Conquest of the Philippine Islands' (1907); also translations of the 'Narrative of De Soto' (1904), and the 'Voyages of Champlain' (1905).

BOURNE, Francis Cardinal, English Catholic clergyman: b. Clapham, 23 March 1861. His father was a convert to the Church, and the future archbishop was educated at Ushaw; at Old Hall, Ware; at Saint Sulpice, Paris, and at Louvain University. He was ordained in 1884 by Bishop Coffin and spent the next five years as assistant priest at Blackheath, Mortlake and West Grinstead, where, having the spiritual care of boys, he showed that interest in their training and fortunes which had been fostered by a stay with the Salesians in Turin. Already devoted to the education of priests in its earlier stages, he left the orphan boys at West Grinstead in 1889, at the call of Bishop Butt, to found the diocesan seminary at Wonersh. He retained the rectorship there till 1898, together with the chair of moral theology and Holy Scripture, and made the institution so much of a model that it became, in a sense, the precedent for separate diocesan seminaries and the best illustration of arguments he himself set forth in a series of still quoted articles in *The Tablet.* In 1896 he was consecrated titular bishop of Epiphania and coadjutor to the bishop of Southwark, whom he succeeded in 1897. In September of that year the new bishop took a leading part in the Saint Augustine celebrations at Ebbsfleet and a little later he accompanied Cardinal Vaughan to Arles, a journey of memorable impressions. In the Southwark diocese a nexus of social and «rescue» enterprises was formed under his rule. He enlisted lay co-operation in rescue work, and, adopting Cardinal Vaughan's watchword of «personal service,» he established two ladies' settlements for work amongst the poor. The development of Catholic boys' brigades, which marked his stay in Southwark, was the outcome of his old interest on boys' behalf. While yet the youngest member of the English episcopate, he was translated to Westminster as Cardinal Vaughan's successor in August 1903. As the fourth of a glorious line — Wiseman, Manning, Vaughan, Bourne — he has a heritage of great traditions, understood, respected, yet interpreted and tempered in accord with the needs and ideals of a new generation. A strong man in his quietness and confidence, he made that strength felt, to the admiration of all England, in his conduct of the Eucharistic Congress of 1908, and especially in his handling of the difficult position created by the action of the government in regard to the proposed procession of the Blessed Sacrament in the public streets. At the consistory held in November 1911, the archbishop assumed «the hire of Westminster,» his elevation to the cardinalate being hailed with joy by his flock and with satisfaction by his countrymen in general. In 1914 he assisted, with Cardinal Gasquet, at the conclave which elected Benedict XV to the see of Rome.

BOURNE, George, American clergyman and anti-slavery writer: b. Westbury, Wiltshire, England, 1780; d. New York, 14 Dec. 1845. In 1804 he settled at Harrisburg, Pa., where he set up a printing office. He was an earnest advocate of the total and immediate abolition of slavery, a position which aroused considerable opposition to him, and in 1815 he formed a church composed of non-slaveholders. His ultra-radical views at last obliged him to remove to Germantown, Pa. Afterward he resided for intervals at Sing Sing, N. Y., Quebec and New York, where he founded a paper, *The Protestant Vindicator.* He wrote 'The Book and Slavery Irreconcilable' (1815); 'Lectures on Ecclesiastical History' (1822); 'Pictures of Quebec' (1830); 'Slavery Illustrated in Its Effects upon Women' (1834).

BOURNE, Hugh, founder of the sect of Primitive Methodists in England: b. Fordhays, Staffordshire, 3 April 1772; d. Bemersley, Staffordshire, 11 Oct. 1852. The revival of camp meetings, following American practice, by himself and others, was considered inadvisable by the authorities of his church; in 1808 he was expelled; two years later the disruption was complete. Mr. Bourne and his friends 20 in number formed a separate organization and Hugh Bourne was acknowledged their elder. The name of Primitive Methodists was adopted in 1812, but by their opponents they were long styled «Ranters.» The sect is now a powerful body in England, numbering, in 1916 205,000 members. In 1844 Bourne visited the United States, where his preaching excited much attention. He also visited Canada, Scotland and Ireland, where he met with great success in his work. For the greater part of his life Bourne worked as a carpenter and builder, while pursuing his religious vocation. He published a 'History of the Primitive Methodists' (1823), and founded, in 1824, *The Primitive Methodist Magazine.* See PRIMITIVE METHODISTS.

BOURNE, Jonathan, American legislator: b. New Bedford, Mass., 23 Feb. 1855; after a short course of study at Harvard University in 1877, he went to sea, was shipwrecked on Formosa, saved and taken to Oregon, where he practised law, became president of various mining and commercial corporations and engaging actively in Republican politics, was elected member of the Oregon House of Representatives 1885, 1896, 1897 and to the United States Senate for the term 1907–13. He was a prominent advocate of reform and became chairman of the Post-Office Committee whose final work inaugurated parcel post service. He was defeated in the 1912 nomination for re-election to the national senate.

BOURNE, Vincent, English poet: b. 1695; d. 2 Dec. 1747. After studying at Westminster, he entered Trinity College, Cambridge, at the age of 19. He took his master's degree in 1721, and was later appointed usher in the Westminster School. His poetical career was not very fruitful, and is best expressed in a volume of Latin verse ('Poemata') published in 1734, and since enlarged and republished. Bourne seems to have possessed some classical charms as a versifier, for both Cowper and Charles Lamb admired his rhymes and even rendered some of them into English. Besides being simple and graceful, as classical poetry invariably was, Bourne's production was characterized by considerable pathos, a thing the earlier classical writers never fell in with. Some of his enthusiastic admirers have even gone so far — rather too far, it seems — as to class Bourne with Tibullus, Propertius, Ansonius, and almost any of the classical writers save Ovid. His epitaphs, however, are models of their kind.

BOURNEMOUTH, bôrn'mŭth, a famous watering-place in the south of England, 30 miles southwest of Southampton, on the English Channel, at the southwest corner of Hampshire, near the boundary of Dorsetshire. It is within the limits of the parliamentary borough of Christchurch, but forms a municipal borough by itself, incorporated in 1890. It is situated on a semicircular bay at the mouth of a small stream, the Bourne, whence it derives its name. Owing to its picturesque scenery and mild and equable climate it is a favorite wintering resort for persons of the well-to-do class who are afflicted with pulmonary complaints. It is to a large extent laid out in villas and detached houses. The Westover Gardens in the centre of the town are a favorite resort; they include a winter garden, where orchestral concerts are regularly given. There are two piers, three arcades, assembly rooms, baths, electric cars, etc. The buildings include hospitals, a sanitorium, home for consumptives and some handsome churches, among the latter being the new Bennett Memorial Church and Saint Peter's Church, both beautiful Gothic buildings. In the churchyard of the latter lie buried William Godwin, Mary Wollstonecraft, and their daughter, the wife of Shelley. The centre of a few fishermen's huts as late as 1838, Bournemouth had in 1911 a population of 78,674.

BOURNONITE, a lead-copper sulphantimonite belonging to the orthorhombic system of crystals. It occurs both crystallized and uncrystallized, has considerable metallic lustre and generally is of steel-gray color. It is found chiefly in the Harz Mountains, Bohemia, Mexico, Chile and the United States (in Colorado, Arkansas and Arizona).

BOURRIENNE, boo-ryĕn, **Louis Antoine Fauvelet de,** French historian and diplomatist: b. Sens, 9 July 1769; d. Caen, 7 Feb. 1834. He was educated with Bonaparte at the school of Brienne, where a close intimacy sprang up between them. On their separation in 1785, when Bonaparte set out to attend the École Militaire in Paris, they vowed an eternal friendship. At the age of 19 he proceeded to one of the German universities, with the view of studying law and languages. He returned to Paris in 1792, and renewed his early friendship with Bonaparte, who employed him in drawing up, together with General Clarke, the text of the Treaty of Campo Formio. From this period Bourrienne's diplomatic career commenced. He accompanied Bonaparte as his private secretary on his expedition to Egypt, and afterward continued in that capacity on his elevation to the consulate. His avarice had already brought him to the verge of ruin, but, nevertheless, in 1804 he was nominated by the Emperor his Minister-Plenipotentiary at Hamburg. Here his duty was to maintain a close watch on the methods of enforcing the Continental System. He removed about 1,000,000 francs from the public treasury and this led to his recall and removal. In the end of 1813 he returned to France, where he received the appointment of director of the posts, and in 1814 was made prefect of police. On the abdication of Napoleon he paid his court to Louis XVIII, who, on his restoration, nominated him a minister of state. The revolution of July 1830, and the loss of his private fortune affected him so much that he lost his reason. He was removed to Normandy, and spent the last two years of his life in a lunatic asylum at Caen, where he died. His 'Mémoires sur Napoléon, le Directoire, le Consulat, l'Empire et la réstauration,' edited by Villemarest (1829–31), contain many interesting particulars of the youth of Napoleon, and also of the history of the Directory and consulate, although they are blamed for want of accuracy in many points of detail.

BOURSAULT, boor-sō, **Edmé,** French writer: b. 1638; d. Montluçon 1701. Having gone to Paris and engaged in literature, he both gained and lost the favor of royalty, and produced pieces for the stage with permanent success; among others, 'Esope à la ville,' and

‘Esope à la cour,’ which still continue on the stage. His two tragedies ‘Marie Stuart’ and ‘Germanicus’ are forgotten. Boursault had the misfortune to quarrel with Molière and Boileau. He wrote a severe criticism on the ‘Ecole des femmes’ under the title of ‘Le portrait du peintre.’ Molière chastised him in his ‘Impromptu de Versailles.’ To revenge himself on Boileau, who had ridiculed him in his satires, he wrote a comedy called ‘Satyre des Satyres.’ His name was later taken off after a reconciliation with Boileau. Consult Taillandier, St. René, ‘Etudes littéraires’ (Paris 1881).

BOURSE, boorz, the name applied to a stock exchange in European countries. The most important of these bourses are, naturally, in the principal cities — at Paris, Berlin, Vienna, London and Petrograd. Some of them are lodged in very costly buildings. The Paris Bourse, for instance, is built in Grecian style of architecture, with handsome Corinthian pillars. See EXCHANGE.

BOUSSA. See BUSSANG.

BOUSSET, boos′sĕt, **Johann Franz Wilhelm,** German religious historian and critic: b. Lübeck 1865. He studied in Erlangen, Lübeck, Göttingen, Leipzig and Heidelberg, and became professor of New Testament exegesis at Göttingen in 1896. In 1903 he became definitely identified with the publication of literature relating to biblical criticism, though he had been, as early as 1897, one of the editors of the *Teologische Rundschau* and he joined the editorial staff of *Forschungen zur Religion und Litteratur des alten und neuen Testaments* in 1903. He was a frequent and important contributor to the ‘Encyclopædia Biblica’ and other publications of a like nature treating of a wide variety of biblical subjects, and doing his most important work in apocalyptic literature, history, eschatology and Gnosticism. His published works include ‘Jesu-Predigt in ihrem Gegensatz zum Judentum’ (1892); ‘Text-kritische Studien zum neuen Testament’ (1894); ‘Antichrist’ (1894); ‘Kommentar zur Offenbarung Johannis’ (1896); ‘Die Religion des Judentums im neutestamentlichen Zeitalter’ (1903); ‘Das Wesen der Religion’ (1903); ‘Hauptprobleme der Gnosis’ (1907); ‘Die Bedeutung der Person Jesu für das Glauben (1910); ‘Faith of a Modern Protestant’ (New York 1913).

BOUSSINGAULT, boo-săṅ-go, **Jean Baptiste Joseph Dieudonné,** French chemist: b. Paris, 2 Feb. 1802; d. there, 12 May 1887. He was educated at the School of Mines of Saint Etienne. He went to South America in the employment of a mining company, where, in addition to making extensive travels and valuable scientific researches, he also served under General Bolivar in the South American war of independence. Returning to France he became professor of chemistry at Lyons; in 1839 was made a member of the Institute, was appointed to the chair of agriculture in the Conservatoire des Arts et Métiers in Paris, and then made Paris his chief residence. In 1857 he was made commander, and later grand officer of the Legion of Honor. Boussingault published numerous valuable papers embodying the results of his scientific researches. His works deal chiefly with agricultural chemistry, and include ‘Economie rurale’ (translated into English and German), ‘Mémoires de chimie agricole et de physiologie’; ‘Agronomie, chimie agricole et physiologie,’ etc. (8 vols., 1860–91).

BOUSSINGAULTITE, boo-săn-gō′tīt, a native hydrated sulphate of magnesium and ammonia, having a formula $(NH_4)_2SO_4.MgSO_4 + 6H_2O$. It has a specific gravity of about 1.7. It occurs with boracic acid (q.v.) in the Tuscan lagoons, especially at the fumaroles of Mount Cerboli. Artificial crystals are prisms belonging to the monoclinic system. A related mineral occurs in soft, white, granular masses in Sonoma, Cal.

BOUSTROPHEDON, a kind of writing found on Greek coins, and in inscriptions of the remotest antiquity. The lines do not run in a uniform direction from the left to the right, or from the right to the left; but the first begins at the left and terminates at the right; the second runs in an opposite direction, from the right to the left; the third, again, from the left; and so on alternately. It is called *boustrophedon* (that is, turning back like oxen) because the lines written in this way succeed each other like furrows in a ploughed field. The laws of Solon were cut in tables in this manner. Consult Roberts, E. S., ‘An Introduction to Greek Epigraphy,’ part ii (Cambridge 1887).

BOUTELLE, bow-tĕl′, **Charles Addison,** American sailor, editor and congressman: b. Damariscotta, Me., 9 Feb. 1839; d. 21 May 1901. He saw early service in the merchant marine and from 1862 in the South Atlantic blockading squadron during the Civil War, taking part as lieutenant in command of the *Nyanza* in the capture of Mobile. In 1870 managing editor and in 1874 proprietor of the Bangor *Whig and Courier,* he interested himself in politics, was appointed delegate to Republican national conventions in 1876, 1880, 1884 and 1888, and was elected member of the National House of Representatives from the 48th to the 56th Congress (1880–1901). In the 51st, 54th and 56th Congresses he was chairman of the House Committee on Naval Affairs and the upbuild of the new United States navy was largely due to his efforts.

BOUTERWEK, bou′-tėr-vĕk, **Friedrich,** German philosopher: b. 15 April 1766, at Oker, a village not far from Goslar, in North Germany; d. Göttingen, 9 Aug. 1828. He was at first a follower of Kant but finally attached himself to Jacobi. In 1791 he became lecturer at Göttingen and six years later was appointed to the chair of philosophy there. His ‘Ideen zu einer allgemeinen Apodiktik’ was the immediate fruit of his intimate acquaintance with the philosophical views of Fr. H. Jacobi. This work was published in two volumes, 1799. It was afterward completed by the ‘Manual of Philosophical Knowledge’ (1813), and by the ‘Religion of Reason’ (1824). In this work, as well as in his ‘Aesthetik’ (1806–24), he had to contend with many powerful antagonists. Bouterwek has gained a permanent reputation by his ‘Geschichte der neuern Poesie und Beredsamkeit’ (History of Modern Poetry and Eloquence) (1801–19), a work which, though unequal in some respects and in parts, especially in the first volume, partial and superficial, is an excellent collection of notices and original observations and may be considered one of the best works of the kind in German literature. Among his minor productions, a selection of which he published in 1818, are many essays, which are superior to the best of his larger speculative works; for instance, the introduction to the ‘History,’ in which he gives an account of his literary labors until that period with great candor and with almost excessive severity against himself. His ‘History of Spanish Literature’ has been translated into Spanish, French and English. He has also written ‘Paulus Septimus’ (1795); ‘Graf Donamar’ (1791); and ‘Ramiro’ (1804); ‘Aesthetik’ (2 vols., 1806); ‘Kleine Schriften,’ with his autobiography (1818).

BOUTMY, boot′mé, **Emile**, French author and educator: b. Paris, 1835; d. 1906. For a time he was a journalist and in 1865–69 was professor of the history of civilization and also of the comparative history of architecture at the Ecole Spéciale d'Architecture. In 1872 he was one of the founders of the Ecole Libre des Sciences Politiques, and for many years was professor of comparative constitutional history there. In 1898 he was elected to the Academy of Moral and Political Sciences. He has published many works which are standard in their field, including ‘Introduction au cours d'histoire comparée de l'architecture’ (1869); ‘Etudes de droit constitutionnel: France, Angleterre, Etats-Unis’ (1885); ‘Développement de la constitution en Angleterre’ (1886); ‘Les Latins’ (1894); ‘Essai d'une psychologie politique du peuple anglais au XIX^{e} siècle (1901; Eng. trans., 1904); ‘Eléments d'une psychologie politique du peuple américain’ (1902).

BOUTO, bootō, or **TUCUXI**, Indian names for the dolphin (*Inia geoffrensis*) of the Amazon. The color variations are extraordinary, some individuals being wholly pink, others black above and pink below. They are seven or eight feet in length.

BOUTROUX, boo′troo′, **Etienne Emile Marie**, French philosopher: b. Montrouge (Seine), 28 July 1845. He was educated at the École Normale Superieure and at Heidelberg, became professor of philosophy at Montpellier in 1874 and subsequently professor of philosophy at the University of Paris. He was elected to the French Academy in 1912. In 1913 he received the degree of LL.D from Princeton University. From an analysis of logic and of cause he contends that the former allows us to perceive permanency, immobility and fatality alone, while the latter enables us to distinguish motion, finality, contingency and progress. His writings include ‘De la contingence des lois de la nature’ (1874; 6th ed. 1907); ‘De l'idée de la loi naturelle dans la science et la philosophie contemporaine’ (1895; English translation, 1911); ‘Questions de morale et d'éducation’ (1895; 4th ed., 1905; English translation, ‘Education and Ethics,’ by Fred Rothwell 1913); ‘Pascal’ (1900; 4th ed., 1907; English translation, 1902); ‘William James’ (1911; 2d ed., 1912; English translation London 1912); ‘Henri Poincaré’ (1913). He also published a translation of the ‘Philosophie der Griechen’ by Eduard Zeller (Vol. I, 1877; Vol. II, 1882).

BOUTS, Dierick or **Thierry**, early Dutch painter: b. Haarlem, probably about 1420; d. Louvain, 6 May 1475. For a long time he was confused with a contemporary painter of Louvain named Stuerbouts, but recent studies have disentangled the two personalities. It is thought that Bouts may have studied with Roger van der Weyden. While history is silent about most of the facts of his life, we know that he was in Louvain in 1447, for he was married there in that year. In 1468 he received the title of municipal painter. In 1473 he remarried, still in Louvain, where he died two years later. His long residence there, together with the character of his work, would almost force us to include him in the Flemish school. His two sons, Thierry II and Albrecht, continued his work without inheriting his genius. The altar of one of the chapels of Saint Peter's at Louvain is probably to be considered Bouts' most important work, although only the centre panel, ‘The Last Supper,’ now remains there, the wings having been carried off to the Munich Gallery. In Saint Peter's, also, is a second altar by him, representing the ‘Martyrdom of Saint Erasmus.’ Other important works by the master are to be seen at Berlin (‘The Crucifixion’). The ‘Head of a Man’ in the Metropolitan Museum of New York is an admirable example of his portraiture. We may notice, beside, ‘The Virgin with the Infant Christ’ at Antwerp. ‘The Martyrdom of Saint Hippolyte’ at Bruges, ‘The Lamentation over the Body of Christ’ in the Louvre and ‘The Crucifixion’ at Granada. Of his pictures for the Town Hall of Louvain, two survive in the Brussels Gallery — ‘The Unjust Judgment of Emperor Otho III’ and ‘The Punishment of the Guilty Empress.’ It is not possible to overlook the art-historical point of view in studying Bouts, as his period was one in which the means of the painter were being developed, and in this respect we must notice the progress he made in the knowledge of representing space. Neither the van Eycks nor Van der Weyden equalled Bouts in this. But from the æsthetic point of view he is even more remarkable. His idea of form and composition is an elevated one, but we must take him as a colorist to find his greatest excellence. «Beyond a doubt Hans Memling, Gerard David, Geertgen van Sint Jans and Quentin Metsys were indebted to Bouts for important impulses toward the pure painter-qualities and for a more intimate conception of nature.» Consult Friedländer, ‘Meisterwerke der niederländischen Malerei der 15 und 16 Jahrhunderts’; Heiland, ‘Dirk Bouts und die Hauptwerke seiner Schule’ (Strassburg 1902), and Fierens-Gevaert, ‘Les primitifs Flamands’ (Brussels 1908).

BOUTS RIMÉS, boo-rẹ-mā (French), words or syllables which rhyme, arranged in a particular order and given to a poet with a subject, on which he must write verses ending in the same rhymes, disposed in the same order. Ménage gives the following account of the origin of this ridiculous conceit, which may be classed with the eggs and axes, the echoes, acrostics and other equally ingenious devices of learned triflers. «Dulot (a poet of the 17th century) was one day complaining, in a large company, that 300 sonnets had been stolen from him. One of the company expressing his astonishment at the number, ‘Oh,’ said he, ‘they are blank sonnets or rhymes (*bouts rimés*) of all the sonnets I may have occasion to write.› » This ludicrous statement produced such an effect that it became a fashionable amusement to compose blank sonnets, and in 1648 a 4to volume of bouts rimés was published. Sarrazin's ‹Dulot vaincu, ou la défaite des Bouts Rimés› is an amusing performance. Etienne Mallemans wrote sonnets on the basis of rhymes furnished him by the Duchess of Maine. Addison ridicules the amusement in the *Spectator,* No. 60.

BOUTWELL, bout'well, **George Sewell,** American statesman: b. Brookline, Mass., 28 Jan. 1818; d. Groton, Mass., 27 Feb. 1905. He was admitted to the bar in 1836, served in the State legislature in 1842–51, was leader of the Democratic party in his State and Governor of Massachusetts 1851–52; was an organizer of the Republican party in 1854, and was appointed the first commissioner of the newly established Department of Internal Revenue in 1862. He was representative in Congress 1863–69, one of the managers of the impeachment trial of President Johnson; Secretary of the Treasury in 1869–73 and a United States senator in 1873–79. In 1877 he was appointed by President Hayes to prepare a codification of the statutes-at-large. The result was the second edition of the ‹United States Revised Statutes› (1878). He was an overseer of Harvard and secretary of the Massachusetts Board of Education, and he prepared many valuable reports. Besides numerous speeches, he published ‹Educational Topics and Institutions› (1859); ‹Manual of the United States Direct and Revenue Tax› (1863); ‹The Taxpayer's Manual› (1865); ‹Speeches and Papers› (1867); ‹The Constitution of the United States at the End of the First Century› (1896); ‹The Crisis of the Republic› (1900); ‹Reminiscences of Sixty Years in Public Affairs› (1902). After 1898 he was especially prominent as a leader of the Anti-Imperialists and vigorous opponent of the Philippine policy of the administration.

BOUVARD, boo-vär', **Joseph Antoine,** French architect: b. Saint-Jean-de-Bournay, 19 Feb. 1840. He was a pupil of Constant Dufeux, whom he assisted in his work connected with the Panthéon, the Law School and the Palace of the Luxembourg. He was appointed inspector of public works in Paris and, in 1879, was city architect, making himself famous by his work on the Théâtre Lyrique, the church of Saint Lawrence and the barracks of the Republican Guard. He transformed the old grain market into a bourse, constructed the railway stations of Sainte Etienne and Marseilles, was architect of the Pavilion of the City of Paris at the Exposition of 1878 and created the magnificent central dome of that of 1889. He had charge of the decoration of Paris at the time of the visit of the Emperor of Russia and won great popularity by the magnificence of the festivals which he arranged. In June 1897, he was appointed director of the newly created administrative direction of architecture and promenades. He took an important part in the preparation for the Universal Exposition of 1900.

BOUVARDIA (named in honor of Bouvard, physician to Louis XIII and superintendent of the Royal Gardens in Paris), a genus of about 25 species of American shrubs or perennial herbs of the family *Rubiaceæ,* natives mostly of tropical Mexico, some of Arizona and Texas. Several horticultural varieties are largely cultivated in greenhouses for their terminal cymes of long four-lobed tubular white, red or yellow, sometimes perfumed blossoms which are very useful as cut flowers during late fall and early winter. The fruit is a two-celled capsule. Bouvardia triphylla in some of its cultural forms is a favorite in borders, producing flowers from June till November.

BOUVART or **BOUVARD, Alexis,** Swiss-French astronomer: b. Les Contamines (Haute-Savoie) near Mont Blanc, 27 June 1767; d. 7 June 1843. Taking an early interest in the stars, in 1785 he went to Paris to attend the free lectures at the Collège de France, became employed in the observatory, was made a member of the bureau of longitudes in 1804, and through the influence of Laplace, whom he assisted in the ‹Mécanique céleste› was elected member of the Academy of Sciences. In 1808 he published new tables of Jupiter and Saturn and in 1821 of Uranus whose irregularities he was the first to point out and explain. He also discovered eight comets. The discovery of Neptune by Leverrier and Adams in 1846 confirmed Bouvart's hypothesis made in 1821.

BOUVET, boo'vā, **Joachim,** French missionary: b. Mans, about 1662; d. Pekin, China, 28 June 1732. Sent by Louis XIV to China to study the customs and institutions of that country, he sailed from Brest 3 Mar. 1685, and sojourning for a time in Siam, reached Pekin in 1688. He was received with favor at the imperial court at Pekin, employed by the Emperor in directing various constructions, instructed him in mathematics, and was allowed to build a church even within the palace. He returned to France in 1697, with permission to take back with him to China as many missionaries as would undertake the voyage. He presented to Louis XIV 49 works in the Chinese language, and in 1699 departed again for China with 10 associates, among whom was the learned Parennin. He labored for nearly 50 years with indefatigable ardor to promote the progress of the sciences in that empire. He gave an account of the state of China in several treatises and letters, and made a dictionary of the language.

BOUVET, Marie Marguerite, American writer: b. New Orleans, La., 14 Feb. 1865, of French parents; d. Reading, Pa., 27 May 1915; spent childhood in France; was educated in the United States; a noted linguist and writer of books for young people. The later years of her life were spent in Reading, Pa. She published ‹Sweet William› (1890); ‹Little Marjorie's Love Story› (1891); ‹Prince Tip Top› (1892); ‹My Lady› (1894); ‹A Child of Tuscany› (1895); ‹Pierrette› (1896); ‹A Little House in Pimlico› (1898); ‹Tales of an Old Château› (1900); ‹Bernardo and Laurette› (1904); ‹Clotilde› (1908); ‹The Smile of the Sphinx› (1911).

BOUVIER, boo'vyā', **John,** American jurist of French birth: b. Codognan, in the department of Gard 1787; d. Philadelphia, 18 Nov. 1851. He was of a Quaker family, which emigrated to this country and settled in Philadelphia, when he was in his 15th year. He obtained employment for several years in a book store, became a citizen of the United States in 1812, published a newspaper for a short time at Brownsville in the western part of Pennsylvania, studied law and was admitted to the bar in 1818. During his studies he made a complete analysis of Blackstone's ‹Commentaries.› In 1822 he began the practice of law in Philadelphia, in which city he resided till his death. In 1838, he became associate judge of the Court of Criminal Sessions. He published, in 1839, a ‹Law Dictionary, adapted to the Constitution and Laws of the United States of America, and of the several States of the American Union,› the fruit of 10 years' labor. In 1841 he published a new edition of Bacon's ‹Abridgement of the Law.› His greatest work, published two months before his death, was the ‹Institutes of American Law.›

BOUVINES, or **BOVINES**, a French village within a short distance of Lille, celebrated for the victory gained by Philip Augustus of France, over Otho IV of Germany, and his allies, 27 July 1214. Philip of Valois defeated here, in 1340, 10,000 English troops; and, on 17 and 18 May 1794, the French here defeated the Austrians.

BOVEE, George, American politician: b. Saint James, La., 1840; d. El Paso, Tex., 1903. He was one of the first native whites to join the Republican party. He was elected Secretary of State in 1868, but quarreled with Governor Warmoth, the head of the administration, and it was this quarrel and the removal of Bovee by Warmoth which led to the political complications in Louisiana, and the dual State government of 1872 to 1876.

BOVES, Jose Tomas, military adventurer in Spanish America; d. 5 Dec. 1814. At the age of 30 he was employed as a naval officer to guard the American coast, but betrayed his trust, and was condemned and imprisoned. After his release, he joined the royal forces, but began to wage war on his own account after the defeat of Cagigal at Maturin. Boves established himself at Calabozo, Venezuela, and with 500 men, many of whom were slaves, defeated Mariño, the dictator of the eastern provinces. He overcame the independents twice, slaughtered all his prisoners, and gained for his army the name of the Infernal Division. He was defeated by Rivas, and a part of his army, being taken captive, were put to death; but he quickly recovered his strength, resumed the offensive and in 1814 defeated Bolivar and Mariño at La Puerta. The struggle was prolonged with alternate successes and reverses, and with incessant cruelties. Boves advanced toward Valencia, where the independents were strongly fortified, and after a blockade forced the town to capitulate. To give a more solemn sanction to the terms of capitulation, a mass was celebrated between the two armies, and at the moment of the elevation, the royalist general promised a strict and faithful observance of the treaty; but having entered the town, he ordered the republican officers and a large number of the soldiers to be shot. Boves was again victorious at Anguita, and obliged Bolivar to retreat to Carthagena. He now entered Caracas, and shortly after gained a new victory, and killed or wounded 1,500 of the independents. His last triumph was at Urica; he was struck by a lance, and died upon the field of battle. His funeral was celebrated amid bloody commotion, while his troops were putting to death the men, women and children whom they had made prisoners.

BOVEY, Henry Taylor, Canadian engineer: b. Devonshire, England, 1852; d. 1912. He was educated at Cambridge University and took up the profession of civil engineering. He was professor of civil engineering and applied mechanics in McGill University in Montreal in 1887–1909. He was the author of ‹Applied Mechanics› (1882); ‹Theory of Structures and Strength of Materials› (1893); ‹Hydraulics› (1895).

BOVIDÆ, one of the most extensive and important families of mammals, charaterized pre-eminently by the possession of hollow persistent horns in both sexes, and the form of digestive apparatus which involves chewing the cud. The family consists of the large herbivorous animals with cloven hoofs, which are most prominent as game, and which have supplied nearly all our domestic animals, except horses and camels. This family includes all of the ruminants, except the deer, giraffes and pronghorn, and embraces five sections or sub-families, namely: the antelopes (Antilopinæ); the goats (Caprinæ); the sheep (Ovinæ); the musk-ox (Ovibovinæ); and the oxen (Bovinae). Although in a general way the members of these sections are easily recognized, all are connected by intermediate examples whose position is assigned with difficulty, so that a general structural likeness covers even such different examples as the delicate antelopes and the heavy cattle. A conspicuous common character is found in the nature of the horns, which gave the name Cavicornia to the group in the early classifications. These horns are always in pairs, and consist of sheaths of horn growing from the skin and covering «cores,» which are protuberances of bone from the frontal bones of the skull, varying in form in the different groups, and contain hollow spaces, which are extensions of the frontal sinuses. These horns begin to grow soon after the animal is born, and increase until they attain their full size with the maturity of the individual; with very few exceptions they are worn by both sexes, but those of the males, especially among sheep, are often considerably larger and more effective as weapons than those of the females. No animal outside of this family possesses hollow horns of this character, except the pronghorn, and in this case they are branched, and are annually shed, neither of which conditions ever occurs among the Bovidæ.

The Bovidæ are distributed throughout the whole world, except Australia and South America. They are in the main gregarious, and where the nature of their habitat permits, as on the plains inhabited by most antelopes and certain bison, they gather into enormous herds. The sheep, goats, and some of the antelopes, are confined to mountain ranges; most of the oxen dwell in forests; and the musk-ox is restricted to Arctic lands. Most of these animals, however, show great adaptability to new climates and conditions, have a high degree of variability, and are susceptible of taming and domestication. In consequence they have furnished to mankind the most important of his aids to agriculture, as the cattle, sheep and goats, which he has been able to take with him to every part of the world, to train to his service, or to develop by careful improvement into the great resources of food and clothing, which they have become. See ANIMALS, DOMESTIC, and the names of the various groups and species composing the family.

BOW, the earliest instrument known, and the most generally diffused, among all savage and barbarous people for the propulsion of missiles in the chase or in war. There are two forms of the bow, the long-bow and the cross-bow, the former of which is the earlier, the more general and by far the more celebrated, as being the weapon of the famous English archers of the Middle Ages, who were popularly said to carry at their belts the lives of four-and-twenty Scots, that being the number of clothyard arrows in their quivers. The long-bow passed out of use as a military weapon with the improvement of firearms; but there were men yet alive in the beginning of last century who remembered that the Highlanders, in the Jacobite rising of 1715, carried bows and arrows; and at the capture of Paris, in 1814, Bashkirs and Circassians, in the service of Russia, were seen in the streets of that city, armed in chain-mail, with bow-cases and quivers. Some of the North American Indians, especially the Comanches and the Apaches, were very expert with the bow. Whatever the substance of which the bow is made, whether of wood, horn or steel, its figure is nearly the same in all countries, having generally two inflexions, between which, in the place where the arrow is fixed, is a right line. The Grecian bow was somewhat in the form of the letter Σ: in drawing it, the hand was brought back to the right breast, and not to the ear. The Scythian bow was distinguished for its remarkable curvature, which was nearly semi-circular; that of the modern Tartars is similar to it. The materials of bows have been different in different countries. The Persians and Indians made them of reeds. The Lycian bows were made of the cornel-tree; those of the Ethiopians of the palm-tree. That of Pandarus was made from the horn of a mountain goat, 16 palms in length; the string was an oxhide thong. The horn of the antelope is still used for the same purpose in the East. The long-bow was the favorite national weapon in England. The battles of Crecy (1346), Poitiers (1356), and Agincourt (1415) were won by this weapon. It was made of yew, ash, etc., of the height of the archer. The arrow being usually half the length of the bow, the clothyard was only employed by a man six feet high. The arbalist, or cross-bow, was a popular weapon with the Italians, and was introduced into England in the 13th century. The arrows shot from it were called quarrels.

Of the power of the bow, and the distance to which it will carry, some remarkable anecdotes are related. Xenophon mentions an Arcadian whose head was shot through by a Carduchian archer. Stuart mentions a random shot of a Turk, which he found to be 584 yards; and Mr. Strutt saw the Turkish Ambassador shoot 480 yards in the archery ground near Bedford Square in London. Lord Bacon speaks of a Turkish bow which has been known to pierce a steel target or a piece of brass two inches thick. In the journal of King Edward VI it is mentioned that 100 archers of the King's guard shot at a one-inch board, and that some of the arrows passed through this and into another board behind it, although the wood was extremely solid and firm. It has been the custom of many savage nations to poison their arrows. This practice is mentioned by Homer and the ancient historians; and we have many similar accounts of modern travelers and navigators from almost every part of the world. Some of these stories are of doubtful authority, but others are well authenticated. Some poison obtained by Condamine from South American savages produced instantaneous death in animals inoculated with it. The poisoned arrows used in Guiana are not shot from a bow, but blown through a tube. See AIR-GUN; ARCHERY; ARMS; BOWS AND ARROWS.

In music it is the well-known implement by the means of which the tone is produced from viols, violins and other instruments of that kind. It is made of a thin staff of elastic wood, tapering slightly till it reaches the lower end, to which the hairs (about 80 or 100 horsehairs) are fastened, and with which the bow is strung. At the upper end is an ornamented piece of wood or ivory called the nut, and fastened with a screw, which serves to regulate the tension of the hairs. It is evident that the size and construction of the bow must correspond with the size of the species of viol-instruments from which the tone is to be produced.

BOW BELLS, the peal of bells belonging to the church of Saint Mary-le-Bow, Cheapside, London, and celebrated for centuries. One who is born within the sound of Bow Bells is considered a genuine «cockney.»

BOW ISLAND, an island in the south Pacific Ocean, near the eastern extremity of the Society Isles, in lat. 18° 6′ S. and long. 140° 51′ W. It is a low island, of coral formation, about 30 miles in length and 5 miles in breadth. It derives its name from its shape, which is bow-like, the outer edge only being of land, and encircling a great central lagoon. It was discovered by Bougainville in 1768.

BOW LEGS, a deformity of the legs in which the knees are far apart and the leg is bowed outward. It is technically known as *genu varum* and is the opposite of knock-knees, or *genu valgum*. Two forms are common, in one the bow is a gradual one, practically the entire leg being bent, in the other the bend takes place quite suddenly just above the ankle. Sometimes the bow is front and back instead of sideways. Bow leg is the commonest of the deformities, making fully 10 per cent of all orthopedic cases. It may be congenital; it is usually due to rickets (q.v.) and perhaps may occur in strong and heavy children who stand too much while very young. In the majority of cases it is outgrown, but in pronounced instances it can be cured only by prolonged correction by means of appropriate braces.

BOW PORCELAIN. England's first porcelain factory was established, at Stratford-le-Bow, in the outskirts of London at that time, probably as early as 1730. From 1744 to 1755 it would appear, from documentary evidence, that this ware was made from *unaker* (an imported American clay) and glass. In 1750 the works were acquired by Weatherby & Crowther. Weatherby died 1762, and Crowther, though bankrupt, continued the works. The factory was called the «New Canton.» The great popularity of the new Derby ware (see DERBY) killed the Bow sales and caused financial ruin. William Dusebury, owner of the Derby works, purchased the Bow plant and transferred it to Derby in 1776. Running for over 30 years with prolific output (in 1760 300 persons, including 90 painters, were employed) yet authenticated pieces are very rare.

Decoration.—Early product followed, of course, the prevailing taste for Chinese style (blue-and-white). The decoration was underglaze. Raised white (*blanc de Chine*) flower motifs belong to this early period. Later, red, green, yellow and blue overglaze colors appear. The gold on early Bow was matt. Sprig decoration was favored in the underglaze blue, and the «quail» or partridge pattern was frequent as a «chinese taste» motif. Some extant Bow pieces have transfer-print decoration, in both over and under-glaze decoration; some transfers filled in by hand.

Characteristics.— Chelsea copied Bow frequently, therefore, some pieces are difficult to place as to provenance. Glaze and paste qualities help here. As Derby took Bow artisans and patterns, the same difficulty also follows the collectors here, from similarity of design and decoration. Bow ware was largely experimental, hence many pieces are defective — crazed or showing black spots in the glaze, from faulty firing. The Bow «ceiling-wax» red has a tendency to powder off. Bow glaze shows age yellowish, even iridescence, at times, from decay.

Paste.— The body is heavy and sometimes thick; but many cups and saucers are of eggshell variety. The paste is hard with close fracture.

Glaze.— Laid on thick, «tears» sometimes appear below. Some authorities claim Bow ware has whiter surface than Chelsea; it is a lead glaze and transparent.

Product.— Table ware, salt cellars, sweetmeat shells, vases, bowls, mugs, toys, well-modeled figures (early figures are in the white); animals, knife handles, epergnes, chandelier ornaments, essence pots, etc.

Marks.— First came triangle mark impressed (Chelsea claims it also); then bow or bow and arrow, violin bow, dagger, anchor in red (like Chelsea); crescent with anchor and dagger (in blue); Mercury alchemistic sign. Workmen's signs: T. F. for Thomas Frye; To for Tebo; A for Askew, etc.

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CLEMENT W. COUMBE.

BOW-WINDOW, *in architecture,* properly a window forming a recess or bay in a room, projecting outward, and having for the outline of the plan a segment of a circle. This term is, however, often confounded with bay-window and oriel, which properly designate, the first a similar window with a straight-sided plan, and the second a projecting window not on the ground-floor, and supported on a corbel or other molded base.

BOW-WOOD. See OSAGE ORANGE.

BOWDICH, bou'dich, **Thomas Edward,** African traveler, one of the victims of the attempts to explore the interior of the Dark Continent: b. Bristol, June 1791; d. 10 Jan. 1824. He was sent to Oxford, but was never regularly matriculated. At an early age he married, and engaged in trade at Bristol. Finding the details of business irksome, he obtained the appointment of writer in the service of the African Company, and set sail for Africa in 1814. In 1816, it being thought desirable to send an embassy to the negro King of Ashantee, Bowdich was chosen to conduct it and he executed with success the duties of his situation. After remaining some time in Africa he returned home, and soon after published his ‹Mission to Ashantee, with a Statistical Account of that Kingdom, and Geographical Notices of other Parts of the Interior of Africa.› Having offended the company in whose service he had been engaged, and having, therefore, no prospect of further employment, yet, wishing ardently to return to Africa for the purpose of visiting its hitherto unexplored regions, Bowdich resolved to make the attempt with such assistance as he could obtain from private individuals. He, however, previously went to Paris to improve his acquaintance with physical and mathematical science. His reception from the French literati was extremely flattering. A public eulogium was pronounced on him at a meeting of the Institute, and an advantageous appointment was offered him by the French government. To obtain funds for the prosecution of his favorite project, Bowdich also published a translation of ‹Mollien's Travels to the Sources of the Senegal and Gambia,› ‹Taxidermy› and ‹British and foreign expeditions to Teembo›; by the sale of which he was enabled, with a little assistance from other persons, to make preparations for his second African expedition. He sailed from Havre in August 1822; stopping at Lisbon, he made a careful study of all the Portuguese discoveries, and published a work entitled ‹An Account of the Discoveries of the Portuguese in Angola and Mozambique› (1824), and arrived in safety in the river Gambia. A disease, occasioned by fatigue and anxiety of mind, here put an end to his life.

BOWDITCH, Charles Pickering, American archæologist: b. Boston, 30 Sept. 1842; d. there, 1 June 1921; a brother of H. P. Bowditch. He was graduated at Harvard University, and while engaged in important manufacturing and commercial pursuits, also cultivated an interest in archæology, and was elected member of numerous scientific societies. He is the author of ‹Maya Nomenclature› (1906); ‹Maya Numeration, Calendar and Astronomy› (1910); ‹Bacon's Connection with the First Folio of Shakespeare› (1910), and numerous pamphlets on Central American archæology.

BOWDITCH, Henry Ingersoll, American physician, son of Nathaniel Bowditch: b. Salem, Mass., 9 Aug. 1808; d. 14 Jan. 1892. He received his degree at Harvard in 1832 and spent several years in study in Paris; was professor of clinical medicine at Harvard in 1859–67; chairman of the State Board of Health in 1869–79; physician at the Massachusetts General Hospital and the Boston City Hospital from 1868 to 1872; and president of the American Medical Association in 1877. He announced the law of soil moisture as a cause of consumption in New England; introduced several new features in surgical treatment, and was author of many general and special works in medical science. He was the first to practise chest-puncture in cases of pleurisy. He was a member of the National Academy of Sciences. Some of his principal publications are ‹Life of Nathaniel Bowditch› (1865); ‹The Young Stethoscopist› (1848); ‹Public Hygiene in America› (Centennial Address, Philadelphia 1876); and translations of ‹Louis on Typhoid› (1836); ‹Louis on Phthisis› (1836); and ‹Maunoir on Cataract› (1837).

BOWDITCH, Henry Pickering, Amercan educator: b. Boston, Mass., 4 April 1840. He was graduated at Harvard in 1861, and subsequently studied chemistry and medicine, and, after the Civil War, in which he reached the rank of major in the Union service, he took a special course in physiology in France and Germany. In 1871–76 he was assistant professor of physiology in the Harvard Medical School, and in 1876 was elected to the full chair but resigned on 9 May 1906. He is a member of the American Academy of Arts and Sciences, as well as of numerous medical societies, and has published many papers on physiological subjects, including ‹The Growth of Children› (1877); ‹Is Harvard a University?› (1890); ‹Advancement of Medicine by Research› (1896); ‹Hints for Teachers of Physiology› (1899).

BOWDITCH, Nathaniel, American mathematician: b. Salem, Mass., 26 March 1773; d. Boston, 16 March 1838. The son of a cooper he went to school till 10 years of age, when he entered his father's shop. Later he was apprenticed to the ship chandlery business, which he followed till he went to sea. He studied incessantly, during intervals of business and in morning and night hours. Mathematics was the science in which he was most interested, and he mastered algebra and Latin unaided. He had a teacher for French, and in later life he took up Spanish, Italian and German. He learned navigation and was an omnivorous reader. In 1795 he made his first voyage as clerk, as supercargo (1796–98) and in the course of five long voyages rose to be master in 1802. His work ‹The New American Practical Navigator› (1802, 1912) was made the standard authority of the United States Navy Department on the subject of navigation, and under the direction of the Secretary of the Navy was revised in 1880, 1903 and 1911. A new and revised edition of his ‹Useful Tables from the American Practical Navigator› was also issued in 1912 under orders of the department. Harvard College gave him a degree of M.A. and offered him the professorship of mathematics, which he declined, as he also did a similar offer from the University of Virginia and the United States Military Academy. Between 1814 and 1817 he translated Laplace's ‹Mécanique céleste,› and appended to it an elaborate commentary. He contributed largely to scientific periodicals, his articles being principally on mathematics and astronomy. He was admitted as a fellow to the Royal Society of London.

BOWDITCH'S PRACTICAL NAVIGATOR, a work on navigation of the highest value and utility to seamen, written by Nathaniel Bowditch (q.v.) and published in 1802.

BOWDLER, bō'dler, **Thomas,** English expurgator: b. near Bath, 11 July 1754; d. Rhyddings, South Wales, 24 Feb. 1825. At the age of 16 he went to Saint Andrews to study medicine, but graduated medical doctor at Edinburgh in 1776, and, after some years of travel, settled in London, devoting himself mainly to charitable work. He lived for 10 years at Saint Boniface, Isle of Wight, and for the last 15 years of his life at Rhyddings, near Swansea. In 1818 he published ‹The Family Shakespeare,› in 10 volumes; in which nothing is added to the original text; but those words and expressions are omitted which cannot with propriety be read aloud in a family. The work had a large sale, and was long popular, despite the ridicule it brought down upon the head of its over-prudish editor, who had the happiness or unhappiness to add permanently to the English tongue the word "bowdlerism" as a synonym for senseless expurgation. The last years of Bowdler's life were given to the task of preparing an expurgated edition of Gibbon's ‹History.›

BOWDLERISM. See BOWDLER, THOMAS.

BOWDOIN, bō'dŏn, **James,** American statesman: b. Boston, 8 Aug. 1727; d. there, 6 Nov. 1790. Graduating from Harvard in 1745, he inherited in 1747 a large fortune from his father, a wealthy merchant, and was thus provided with means to gratify his taste for scientific investigation. In 1751 he visited Franklin, who explained to him the results of his electrical researches. A correspondence ensued that lasted many years, and Franklin read Bowdoin's letters before the Royal Society of London. He was a prominent figure in the politics of his State, being elected a member of the General Court 1753–56, and the Council 1756–69. He presided over the Constitutional Convention in 1779, and to him was due the form of some of the most admired sections of the constitution it drew up. As governor, 1785–86, he quelled Shay's Rebellion. In 1788 he was a delegate to the Federal Constitutional Convention. He was a fellow of Harvard College from 1779 to 1785 and to it he left a legacy of £400. He was a liberal patron of the Massachusetts Humane Society. A founder and first president of the American Academy of Arts and Sciences, he bequeathed it his very valuable library. The degree of doctor of laws was conferred upon him by the universities of Yale and Edinburgh. Bowdoin College in Brunswick, Me., was named in his honor. He wrote a poetical paraphrase of Dodsley's 'Economy of Human Life' (1759), and several papers which may be found in the first volume of the American Academy's 'Memoirs.' To the 'Pietas et Gratulatio,' a volume of poems published by Harvard on the accession of George III, he contributed an English poem and two Latin epigrams.

BOWDOIN, James, American statesman (son of the preceding): b. Boston, 22 Sept. 1752; d. Naushon Island, Buzzard's Bay, 11 Oct. 1811. He was graduated from Harvard in 1771, studied at the University of Oxford and traveled in Europe. At the outbreak of the Revolution he returned home and became successively a member of the assembly, the State senate, and a delegate to the State Constitutional Convention, 1779. In Jefferson's administration he was appointed Minister Plenipotentiary at the court of Spain, and associate Minister to France. During his residence abroad he accumulated a valuable library, a collection of paintings and drawings by old and modern masters, a cabinet of minerals and fossils, together with models of crystallography, all of which he bequeathed to Bowdoin College, of which he was the earliest patron. During his lifetime he gave it 6,000 acres of land and £1,100, and at his death it became, by will, his residuary legatee. He translated Daubenton's 'Advice to Shepherds,' and was the anonymous author of 'Opinions respecting the Commercial Intercourse Between the United States and Great Britain.'

BOWDOIN COLLEGE, located at Brunswick, Me. It is the oldest institution of higher learning in the State, having been incorporated in 1794, while Maine was a part of Massachusetts. It was named for James Bowdoin, governor of Massachusetts, whose son gave largely to the college. It was not opened to students until 1802. It is non-sectarian in government and instruction. In addition to the college proper, the organization includes the Medical School of Maine, founded in 1820. The college confers the degree of A.B. and B.S. for the completion of the regular four years' course. The work is almost entirely elective after the freshman year. The campus consists of 40 acres, one mile from the Androscoggin River, about three miles inland from Casco Bay. The buildings include Massachusetts Hall (the original building), King Chapel, Memorial Hall, Mary Francis Searle Science Building, Walker Art Building, Hubbard Hall (the library), Adams Hall, Observatory, the Gymnasium, the Hyde Athletic Building, the Bowdoin Union and the Dudley Coe Memorial Infirmary. The library, in 1916, contained 113,418 volumes; the students numbered 457 and the faculty 89. A number of Bowdoin graduates have been distinguished in literary and public life; among them are Longfellow and Hawthorne, Thomas B. Reed and Melville Weston Fuller (chief justice).

BOWELL, Sir **Mackenzie, K.C.M.G.,** Canadian statesman: b. Suffolk, England, 27 Dec. 1823; d. Belleville, Ontario, 10 Dec. 1917. When he was 10 years old his parents emigrated to Canada and settled on a farm. At the age of 12 the youth was apprenticed in the printing department of the Belleville *Intelligencer,* of which paper he later became editor and proprietor, the connection lasting from 1834 to 1878. He was elected to the House of Commons for North Hastings, Ontario, in 1876, was Minister of Customs in 1878, Minister of Militia 1892 and Minister of Trade and Commerce 1893–94. He was Premier of Canada from 1894 to 1896. He held several other government offices and was a prominent advocate in educational affairs. He entered the Senate in 1893 and acted as chairman of the Colonial Conference in 1894. He relinquished cabinet office in 1896 and in 1897 declared his independence of all party affiliation. Bowell assisted in raising a rifle company in 1857; he served on the frontier during the American Civil War and again during the Fenian raids of 1866. As late as March 1906 he was still leader of the Opposition in the Senate, when he resigned, in his 83d year.

BOWEN, Francis, American educator and author: b. Charlestown, Mass., 8 Sept. 1811; d. Cambridge, Mass., 21 Jan. 1890. He was graduated from Harvard in 1833, and for a time taught mathematics in Phillips-Exeter Academy. He became instructor in natural philosophy and political economy at Harvard, 1835; studied in Europe, 1839–41, meeting Sismondi and De Gerando. Returning to Cambridge in 1843 he took charge of the *North American Review,* as editor and proprietor, and conducted it with great ability for nearly 11 years. On account of his having taken the unpopular side in the *Review* on the Hungarian question, the overseers of Harvard refused to concur with the corporation in appointing him professor of history in 1850. When Dr. Walker became president of Harvard in 1853, Professor Bowen was elected Alford professor of natural religion, moral philosophy and civil polity, and held that chair until 1888, when he became professor emeritus. He opposed the doctrines of Darwin and accepted those of Sir William Hamilton, and in philosophy upheld the views of Locke and Berkeley against those of Cousin, Comte, Fichte, Kant and Mill. He was a clear, forceful, independent thinker, and possessed a style notable for its energy and precision. As a writer he was most industrious, treating with success widely varying topics. The following is a selected list of his publications: 'Documents of the Constitutions of England and America, from Magna Charta to the Federal Constitution of 1789' (1854); 'The Principles of Metaphysical and Ethical Science applied to the Evidences of Religion' (1855); 'Dugald Stewart's Philosophy of the Human Mind, with Critical Notes' (1854); 'Principles of Political Economy' (1856); 'The Metaphysics of Sir William Hamilton' (1862); 'De Tocqueville's Democracy in America, edited with notes' (1862); 'Logic, or the Laws of Pure Thought' (1864); 'American Political Economy' (1870).

BOWEN, Sir **George** (Ferguson), English colonial administrator: b. Ireland 1821; d. 21 Feb. 1899. He was graduated at Charterhouse, and Trinity and Brasenose Colleges, Oxford. He was president of the University of Corfu 1847–51, and chief secretary of the Ionian Islands in 1854. He was first governor of the colony of Queensland, 1859–67; governor of New Zealand, 1867–73; governor of Victoria, 1873–79; of Mauritius, 1879–83; and of Hongkong, 1883–87. He was the author of ‹Ithica in 1850›; ‹Mount Ethos, Thessaly, and Epirus› (1852); and of his official dispatches, full of observation, graphic description and political insight, a selection was made and edited by Stanley Lane-Poole in 1891 under the title ‹Thirty Years of Colonial Government.›

BOWEN, Henry Chandler, American editor and publisher: b. Woodstock, Conn., 11 Sept. 1813; d. 24 Feb. 1896. He received a common school education. In 1833 he removed to New York, where he became a member of the drapery and silk firm of Bowen and McNamee. In 1848 he helped to found the *Independent,* in New York, becoming, in 1861, its editor and proprietor, and making the paper famous for its advanced views on public topics. His open denunciation of the Fugitive Slave Law caused his firm to be boycotted in the South in 1852. He declared at that time that his firm had «its goods but not its principles for sale.»

BOWEN, Herbert Wolcott, American diplomatist: b. Brooklyn, N. Y., 29 Feb. 1856. He was educated at Yale University and at the Columbia Law School. He was appointed United States consul at Barcelona in 1890 by President Harrison, and in 1894 President Cleveland made him consul-general of the same port. At the opening of the Spanish-American War he remained at his post as long as was practicable, and at the conclusion of the war was appointed by President McKinley consul-general at Teheran, and in May 1901 Minister Plenipotentiary to Persia. He was subsequently appointed Minister to Venezuela, but was retired in 1905. He has published ‹Verses›; ‹Losing Ground›; ‹In Divers Tones›; ‹De Genere Humano›; ‹International Law.›

BOWEN, John Wesley Edward, American theologian: b. New Orleans, 3 Dec. 1855. He was graduated at Boston University in 1878, and in 1885 received the degree of Ph.D., from the University of New Orleans. He held pastorates in Newark N. J., Boston, Baltimore and Washington, 1882–92. He was professor of church history and systematic theology in Morgan College, Baltimore, 1888–92; professor of Hebrew, Howard University, Washington, 1891–92, and since 1893 has been president and professor of the history of theology in Gammon Theological Seminary, Atlanta, Ga. Publications: ‹Sermons›; ‹Africa and the American Negro›; ‹Discussion in Philosophy and Theology›; ‹Struggles for Supremacy between the Church and State during the Middle Ages›; ‹The Catholic Spirit of Methodism›; ‹The Theology and Psychology of the Negro Plantation Melodies›; ‹The Psychological Process in the Revelation of Doctrine›; ‹The Religious History of the Negro›; ‹The Education of the Negro›; ‹The United Negro,› etc. Dr. Bowen is a recognized leader in all movements for the advancement of the negro.

BOWER, Archibald, Scottish writer: b. near Dundee, 17 Jan. 1686; d. London, 3 Sept. 1766. He was educated at the Scottish College in Douai and entered the order of Jesuits in 1706. At Macerata (1723–26) in Italy, according to his own account, he was counsellor or judge of the Inquisition. In 1726 he quitted the order of Jesuits and went to Perugia, whence he fled secretly to England and professed himself a convert to the Protestant faith. He obtained respectable patronage, was engaged as a tutor in a nobleman's family and employed by the booksellers in conducting the *Historia Literaria,* a monthly review of books, and in writing a part of the ‹Universal History,› in 60 volumes. The money which he gained by these occupations he is believed to have given or lent to the society of the Jesuits, and thus to have purchased his readmission among them about the year 1744. Subsequently repenting of the engagement he had made with his old associates, he claimed and recovered the property he had advanced. In 1748 he published the first volume of a ‹History of the Popes,› which was continued to seven volumes and characterized by the utmost zeal against Roman Catholicism. This work was reprinted in Philadelphia 1844–45, with a continuation in three volumes by Dr. S. H. Cox. His money transactions with the Jesuits being at last brought to light, he was generally believed to be a man destitute of moral or religious principle; so that toward the end of his life he had hardly a friend or patron left except Lord Lyttelton. He is said to have died a Protestant.

BOWER, Frederick Orpen, English botanist: b. Ripon, 4 Nov. 1855. He was educated at Repton and Trinity College, Cambridge, and has been regius professor of botany at Glasgow University since 1885. His works include ‹Course of Practical Instruction in Botany› (3d ed., 1891); ‹Practical Botany for Beginners› (1894); ‹The Origin of a Land Flora› (1908); ‹Plant Life on Land› (1911), etc.

BOWER-BIRDS, a group of birds dwelling in Australia and the neighboring islands, remarkable for the construction of bowers or «play-houses» in addition to their ordinary breeding-nests. They were formerly considered as members of the family of the birds-of-paradise, but now the numerous genera and species are placed in the family of *Ptilonorhynchidæ.* There are 14 genera, embracing about 37 species. All are moderate size, of dark and plain plumage, having few ornaments of color and none of feather characteristic of other birds-of-paradise, although, like them, they are of arboreal habits, feed mainly upon fruits, and construct rather rude nests for their eggs in branches of trees. The birds were first described by Dr. John Gould, the ornithological explorer of Australia, in 1840. In addition to the nest proper, the males of all the bower-birds build upon the ground bowers or shelters of various forms, which serve as places for assembling and holding the series of antics or dances, in rivalry with each other, and as a display of their respective attractions to the females, in which these birds indulge during the season of courtship. These buildings always occupy a little space in the forest which is first carefully cleared of every obstruction, so that they look like small cultivated lawns. A few species are content with such a lawn, but most erect buildings which vary in form according to the species. The satin-bird (*Ptiloryncus violaceus*) of southern Australia, the most familiar of these, is about the size and somewhat the shape of a jackdaw, but the sexes are dissimilar, the males having a plumage of satiny black, while the females and young are grayish green. It forms of twigs, a few inches in length, an oblong, dome-shaped hut, open at each end and floored with twigs. The sides of this hut are formed of slender twigs, planted upright, and leaning inward to form a roof. Its floor, and the ground all about it, are strewn with highly colored feathers and bright objects of all sorts, which the bird brings, day by day, sometimes from a great distance, to add to his store, replacing dull or faded pieces with something better as he finds them. The people of the region are accustomed to search these collections for such lost articles as bits of bright jewelry, which the birds frequently seize and take there. The spotted bower-birds, of the genus *Chlamydera,* form «runs» or avenues about three feet long, formed of a dense platform of sticks fenced in on each side by a hedge of upright twigs, and place near it hundreds of white pebbles, pieces of bleached bone, shells and bright objects, which they rearrange with incessant activity. The regent bird, *Sericulus chrysocephalus,* which has a rather limited range in the region north of Sydney, and breeds along the Brisbane River, gathers snail-shells exclusively. Another species make several little huts — a miniature of a village of the black fellows. The most remarkable of these structures, however, is that of a New Guinea species (*Amblyornis inornatus*) which is called «gardener-bird» in the books. This bird clears a space around the base of a small tree, and then piles up around its base a cone of moss, about 18 inches in height. Outside of this, and at a distance of four or five inches, it plants a circle of twigs, some of which are two feet in length, so that they form a conical hut, covering and enclosing the inner cone. Two doors are left in this outer hut at opposite sides. The twigs of which this «wigwam» is composed are always the thin stems of an epiphytal orchid, which retain their leaves and remain alive and blooming for a long time; and it is believed by Dr. Beccari, who first described this bird, that the orchids are chosen because they will remain alive. He says, however, that this apparent attempt to provide flowers is not restricted to the cabin. Directly in front of the entrance is made a miniature meadow of soft moss, which is kept smooth and clean, and upon which are scattered flowers and fruit of different colors, bright fungi and brilliantly colored insects, so that the place reminds one of an elegant little garden. Moreover, when these objects have been exposed so long as to become wilted they are taken away and replaced by others, so that it seems impossible to believe that the birds do not take a real delight in the freshness of their flowers, and the brightness and color of their ornaments. The activity and curiosity of all these bower-birds are strong characteristics, and they seem to derive great amusement, not only from their architectural arrangements, but in gathering, placing and rearranging their treasures, and in keeping the premises in the neatest and prettiest condition possible. It is difficult to understand how any other purpose is served by these structures than simply that of providing a convenient place for the lively movements by which they display themselves to the females, as has been alluded to above, and for the duels which frequently take place between rival males, sometimes with fatal results; but to this must be added the gratification of an inherited instinct of acquisitiveness, and a real delight in beautiful things. The species of another genus (*Prionadura*) make similar «bowers» four to six feet high.

Detailed descriptions of these and several other similar birds and their works will be found in the books relating to the ornithology of Australia and New Guinea, and especially in the writings of the Italian naturalists, Beccari and Salvatori. An excellent résumé may be read in Lydekker's ‹Royal Natural History,› Vol. III (London 1885). Several species have been brought alive to Europe and may usually be seen, with their curious bowers, in the zoological gardens of London, Paris and elsewhere; while the museums in New York and Washington contain models of some of their ornamental structures.

BOWERBANK, James Scott, English geologist: b. 1797; d. 1877. A partner in a London distillery, his leisure was absorbed by geological research, and he was one of the founders of the «London Clay Club» (1836), the members of which devoted themselves to the task of examining the fossils of this formation. In 1840 he published ‹Fossil Fruits of the London Clay,› which is still the acknowledged authority on the subject. In 1847 he was one of the founders of the Palæontological Society. His most important work, ‹A Monograph of the British Spongidæ,› the fruit of immense labor, was published in four volumes (1864–82). His magnificent collection was purchased by the British Museum.

BOWERS, Elizabeth Crocker, American actress: b. Ridgefield, Conn., 12 March 1830; d. Washington, D. C., 6 Nov. 1895. She made her first appearance on the stage at the Park Theatre, New York, in 1846, and in 1847 married David P. Bowers. Later she appeared in Philadelphia as Donna Victoria in ‹A Bold Stroke for a Husband.› She was a stock member of the Arch Street Company in Philadelphia until her husband's death in 1857. She was married in 1860 to J. C. McCollom, and the next year made a professional trip to England with great success. She returned to New York in 1863, and, after fulfilling several engagements, retired from the stage. In 1884 she returned to the stage in ‹La Charbonniere,› and in 1886 began a series of performances with her own company at the 14th Street Theatre in New York. She played with Rose Coghlan in ‹A Woman of No Importance,› in 1893, and supported Olga Nethersole in her first appearance in the United States in 1894. Her last impersonation was that of Lady Margrave in ‹The New Woman› in the early part of 1895.

BOWERS, Lloyd Wheaton, American lawyer: b. Springfield, Mass., 9 March 1859; d. 9 Sept. 1910. A graduate of Yale University 1879, and of Columbia Law School 1882, he settled in Winona, Minn., and soon achieved distinction in his profession, receiving the appointment of general counsel of the Chicago and Northwestern Railway Company in 1887.. The adjustment of relations of great public service corporations, notably the Standard Oil and Tobacco trusts, to the general public welfare, was his special forte. He was appointed solicitor-general of the United States by President Taft in March 1909, and during the 17 months prior to his death prepared for trial 37 cases, of which 33 were successfully prosecuted.

BOWERS, Theodore S., American soldier: b. Pennsylvania, 10 Oct. 1832; d. Garrison's Station, N. Y., 6 March 1866. At the outbreak of the Civil War he was editor of a Democratic paper in Mount Carmel, Ill. After the battle of Bull Run he raised a company for the 48th Illinois Infantry, but declined its captaincy on account of the taunts of former political associates, and went to the front as a private. On 25 Jan. 1862 he was detailed as a clerical assistant at General Grant's headquarters. That officer found him invaluable and kept him near him until the close of the war. He went through the campaigns of Forts Henry and Donelson, and while the army was absent on the Tallahatchie expedition Bowers was left in charge of the department headquarters, having received a regular staff appointment as captain and aide-de-camp. When Van Dorn seized the headquarters at Holly Springs 20 Dec. 1862, Bowers destroyed all the departmental records that would have been of value to the Confederates, refused to give his parole and made his escape during the night. He was brevetted colonel and brigadier-general for gallant and meritorious services, and after the war General Grant retained him on his personal staff, having procured his appointment as assistant adjutant-general with rank of major in the United States army, 6 Jan. 1865. He was killed while boarding a moving train.

BOWERY, The, a street in New York. Its original name, the *Bouwerie,* was derived from the estates of the governor, Peter Stuyvesant, whose farm and orchards, embracing the region lying about the upper part, were called the Great Bouwerie. It begins at Chatham Square and terminates at Cooper Union, and runs parallel to Broadway. It was long notorious for the resorts located along its length, but its character has undergone improvement. It is still characterized by the heterogeneity of its population and a multitude of cheap shops and boutiques.

BOWFIN, a fish (*Amia calva*) of the Mississippi Valley. See MUDFISH.

BOWHEAD, the Greenland or right whale, taking its name from the arched outline of its head. See GREENLAND WHALE.

BOWIE, bō'ę, **James,** American frontiersman: b. Burke County, Ga., about 1790; d. 6 March 1836. He took part in the revolt of Texas against Mexico, and fell in the Alamo massacre. He gave his name to the bowie-knife (q.v.).

BOWIE, Tex., city in Montague County, 65 miles north of Fort Worth, on the Chicago, Rock Island and Gulf and the Fort Worth and Denver railroads. It contains cotton gins, oil compresses, a refrigerating plant and has a large trade in cotton, grain and live stock. The city owns the waterworks. Pop. 2,874.

BOWIE-KNIFE, a long knife shaped like a dagger, but with only one edge, named after Col. James Bowie (q.v.). Its use as a weapon was originally confined to Texas, but it is now used in almost all the States of the Union. Colonel Bowie is said to have had his sword broken down to within about 20 inches of the hilt in a fight with some Mexicans, but he found that he did such good execution with his broken blade that he equipped all his followers with a similar weapon. According to another story Bowie made his first knife from a file. As a knife of very similar form had been in use throughout the Latin American colonies, it seems probable that Bowie got the idea of the knife that bears his name from the Mexicans in Texas and along the Mexican border.

BOWKER, bow'kėr, **Richard Rogers,** American author: b. Salem, Mass., 4 Sept. 1848. He was graduated at the College of the City of New York in 1868, and has been prominent in politics as an independent and was the originator of the independent Republican movement of 1879. He has edited the *Publisher's Weekly,* the *Library Journal* and the *American Catalogue,* and has published ‘Work and Wealth’; ‘Economics for the People’; ‘Copyright: Its Law and Its Literature’; ‘Primer for Political Education’; ‘Electoral Reform’; ‘The Arts of Life’; ‘Civil Service Examination.’

BOWLDERS, detached masses of rock of varying size. When very small, they are more properly called pebbles. Bowlders are of various origins. Frost-work acting in joints wedges off angular blocks of rock that accumulate near where they are formed. (See TALUS). Further weathering may round these blocks. Solution along joints and bedding planes may isolate and round blocks known as bowlders of weathering. Such bowlders are often transported by rivers, either rolled along the bottom or frozen into floating cakes of ice. River or wave-worn bowlders are usually well rounded and polished. Particularly striking in glaciated regions are the erratic bowlders that lie strewn over the surface of the ground. These glacial bowlders usually vary from subangular to rounded and are not infrequently strongly striated. They are often composed of rock substance totally foreign to the region in which they occur, having been brought by the ice from distant points.

BOWLES, bōlz, **Francis Tiffany,** American naval constructor: b. Springfield, Mass., 7 Oct. 1858. He was graduated at the United States Naval Academy in 1879, studied at the Royal Naval College, Greenwich, England, and was appointed a member of the United States naval advisory board in 1882, and has ever since been prominent in the work of naval construction, with special reference to the rehabilitated United States navy. He has been in charge of construction at the navy yards in Norfolk and Brooklyn, and was made chief constructor of the navy with the rank of rear-admiral in 1901. He resigned in 1903 to become president of the Fore River Shipbuilding Company, from which he has since retired. He is a member of the London Institute of Naval Architects.

BOWLES, Richard Finch, Canadian preacher and educator: b. near Brampton, Ontario, 1864. He was educated at Brompton High School and Victoria University, at which he graduated B.A. in 1885. He was ordained to the Methodist ministry in 1888, and has held, among other charges, those of Sherbourne street (twice) and the Metropolitan, Toronto, and Grace Church, Winnipeg. In 1905 he was appointed professor of homiletics in Victoria University and became in 1913 chancellor of the university.

BOWLES, Samuel, American journalist: b. Springfield, Mass., 9 Feb. 1826; d. 16 Jan. 1878. He edited the Springfield *Republican* for over 30 years. This journal had been established by his father, and under the younger Bowles soon became a leader in New England journalism. He traveled all over the United States and took great interest in good government. He published ‘Our New West (1869); ‘Across the Continent,’ and ‘The Switzerland of America.’ Consult Merriam, ‘The Life and Times of Samuel Bowles’ (1885).

BOWLES, William A., Indian agent and chief: b. Frederick County, Md.; d. 23 Dec. 1805. When 13 years of age he ran away from home and joined the British army at Philadelphia. He afterward joined the Creek Indians, married an Indian woman and was one of the English emissaries to excite the Creeks against the Americans. After the war he went to England, and on his return to America his influence among the Indians was so hostile to the Spaniards that they offered a price of $6,000 for his capture. He was taken in July 1792,, sent to Madrid and afterward to Manila. Having obtained leave to visit Europe, he returned among the Creeks and instigated them to renewed hostilities. He was betrayed again into the hands of the Spaniards in 1804 and died in Morro Castle, Havana. His biography was published in London in 1791.

BOWLES, William Lisle, English poet: b. King's Sutton, Northamptonshire, 1762; d. Salisbury, 7 April 1850. He was educated at Winchester and Oxford. In 1804 he became vicar of Bremhill, Wiltshire, and a prebendary of Salisbury Cathedral. Coleridge and Wordsworth, seeking for new and more natural chords of poetry, were affected to such an extent by his ‘Fourteen Sonnets’ that Bowles is considered to have created, by his influence, the Lake School of Poetry. In 1806 he issued a critical edition of Pope, which led to a memorable controversy (1809–25), in which Byron and Campbell were his opponents. His other works include ‘The Grave of Howard’ (1790); ‘Coombe Ellen’ (1798); ‘The Battle of the Nile’ (1799); ‘The Spirit of Discovery’ (1804), his longest poem; and ‘Saint John in Patmos’ (1832). Consult Gilfillan, ‘Poetical Works,’ with memoir (ed., Edinburgh 1855).

BOWLING (bō'lĭng) **GREEN,** Ky., city and county-seat of Warren County, 114 miles southwest of Louisville, of prominence as an educational centre. Here are situated Ogden College, founded in 1877; Potter College for women, opened in 1889; the Southern Normal School; Saint Columba's Academy and a business college. The city is surrounded by a fertile agricultural region, has an important trade in hogs and mules and one of the largest horse markets in the State. The region produces corn, hay, wheat, oats, vegetables and tobacco. It contains two parks, one of 42 acres, and owns and operates its waterworks and electric-lighting establishment. It was incorporated in 1812 and is governed by a mayor elected every four years, and a city council. At the time of the Civil War Bowling Green was of much strategic importance to the Confederate army. Pop. 9,638.

BOWLING GREEN, Mo., city and county-seat of Pike County, 90 miles northwest of Saint Louis, situated on the Chicago & A. and Saint Louis & H. railroads. It was settled in 1820 and incorporated in 1838. Its present government is vested in a mayor, elected biennially, and a board of aldermen. Pike College and a sanatorium are here located and among the industries of the place are flour and pipe manufacturing. There are also stone quarries nearby. Pop. 1,965.

BOWLING GREEN, Ohio, city and county-seat of Wood County, situated on the Cincinnati, H. & D. and the Toledo & O. C. railroads, 22 miles south of Toledo. It carries on a trade in farm produce and is the centre of a region producing oil and natural gas. Among the other industries are iron smelting, canning and glass-cutting, motor trucks, marine engines and underwear. Private companies operate waterworks, gasworks, an electric-lighting system and a hot water heating plant. The city was settled in 1832 and incorporated as a borough 1855 and city in 1900. It is governed by a mayor biennially elected and a board of public service of five members. Pop. 6,000.

BOWLING GREEN, a park in New York city, consisting of a triangular strip at the beginning of Broadway. It was a parade ground in the Dutch period and was bounded on the south by Fort Amsterdam, the site of which is now occupied by the custom house. In the colonial period the green was surrounded by fashionable dwellings, which in the modern city have been replaced by towering skyscrapers. A statue of George III was erected on the green in 1770, but six years later was melted into bullets for the Revolutionary army.

BOWLING, an American indoor game; also much played in Great Britain, and probably a modification of the English game of skittles (q.v.). It is played in a covered alley of carpenter's work from 65 to 70 feet in length and about 3 feet 6 inches wide. The alley has a gutter on each side and is slightly convex in the centre and regularly beveled toward the gutters. At the farther extremity 10 pins, generally of ashwood, about 12 inches high, and shaped somewhat like a champagne bottle with a slightly tapering base, are set up in the form of a triangle having its apex toward the bowler; that is, with four pins on the rear or fourth line, three on the third, two on the second and one on the first line, all being 12 inches apart. The pins are uniform in weight. The balls may never exceed 27 inches in circumference; but smaller sizes are optional. The bowler is entitled to two (formerly three) balls, which he rolls at the pins, the object being to knock down as many pins as possible, the number displaced being registered to the bowler's credit. The first record of a match seems to have been made on 1 Jan. 1840, at the Knickerbocker Alleys, New York, but it was not until 1875 that the bowlers of the principal cities held a convention for the purpose of framing rules for the game, and it was 20 years later when the American Bowling Congress brought the sport into anything like systematic order. The rules of the game in all its varieties are published by the Congress.

BOWMAN, Alexander Hamilton, American soldier: b. Wilkesbarre, Pa., 15 May 1803; d. there, 11 Nov. 1865. He graduated from the United States Military Academy at West Point, 1825, and entered the engineering corps. For a year he was assistant professor of geography, history and ethics at the academy. He acted as assistant engineer in the construction of the defenses and of the improvements to harbors and rivers on the Gulf of Mexico, 1826–34, and was superintending engineer of the construction of Fort Sumter, 1838–51. Later he was chief engineer of the construction bureau of the United States Treasury, and employed in building custom houses, post offices, marine hospitals, etc. During the Civil War he was superintendent of the United States Military Academy, and from 20 June 1865 till his death was a member of the board of engineers to carry out in detail the modifications of the defenses in the vicinity of Boston, Mass. He attained his lieutenant-colonelcy in the engineering corps 3 March 1863.

BOWMAN, Edward Morris, American organist: b. Barnard, Vt., 18 July 1848; d. 27 Aug. 1913. His musical education was thorough and varied. He studied in New York under Dr. William Mason, in London under Dr. Bridge, in Berlin under Weitzmann and Bendel and in Paris under Guilmant. He was conspicuously successful as an organist, choral conductor and teacher. In 1895 he took charge of the Temple Choir in connection with the Baptist Temple, Brooklyn, N. Y., and succeeded in making popular a high standard of music, both ecclesiastical and secular. In 1891 he succeeded Dr. F. Ritter as professor of music at Vassar College, and in 1892 was appointed examiner to Evelyn College, Princeton, N. J. After 1906 he was musical director of Calvary Baptist Church, New York. He was a founder and for eight terms president of the American College of Musicians. His compositions comprise songs, part songs, anthems and orchestral numbers. He published ‹Bowman-Weitzmann Manual of Musical Theory› (1877); ‹Harmony: Historic Points and Modern Methods›; ‹Formation of Piano Touch›; ‹Relation of Musicians to the Public.›

BOWMAN, Thomas, American Methodist bishop: b. Berwick, Pa., 15 July 1817; d. 3 March 1914. He was graduated at Dickinson College 1837, and entered the ministry in the Baltimore conference of the Methodist Episcopal Church. In 1848 he organized the Dickinson Seminary at Williamsport, Pa., and was its president for 10 years. In 1858 he was elected president of Indiana Asbury University (now DePauw University), remaining there until May 1872, when he became a bishop. He was chaplain to the United States Senate in 1864–65. In 1899 he became chancellor emeritus of DePauw University. He visited all the conferences in the United States, Europe, India, China, Japan and Mexico and was distinguished for his fine pulpit eloquence.

BOWMAN, Sir William, English anatomist and ophthalmic surgeon: b. Nantwich, 20 July 1816; d. London, 29 March 1892. He studied at the General Hospital, Birmingham, at King's College, London, and on the Continent. In 1840 he was appointed junior demonstrator of anatomy at King's College; in the same year assistant surgeon, and in 1856 full surgeon; in 1851 full surgeon in the Royal Ophthalmic Hospital, Moorfields. In 1848 he was elected to the chair of physiology and of general and morbid anatomy at King's College. He gained the Royal Society's royal medal for physiology in 1842. In 1880 Cambridge, and in the following year, Edinburgh, conferred on him the degree of LL.D. He was connected with a large number of scientific societies, both British and foreign, was collaborator with Todd in the great work on the ‹Physiological Anatomy and Physiology of Man› (5 vols., 1845–56), and he also wrote ‹Lectures on the Eye› (1849); ‹Collected Papers› (1892), edited by J. B. Sanderson and J. W. Hulke, with a memoir by H. Power. His baronetcy was conferred on him in 1884.

BOWMAN ACT, an act of Congress which became a law 3 March 1883, under the provisions of which any claim or matter requiring investigation may be referred to the Court of Claims by either house of Congress or any of its committees, though Civil War claims or claims barred by law are not included. The court does not enter judgment but merely reports its findings which are continued from Congress to Congress until final action is taken. Four years later an act, known as the Tucker Act, was passed by Congress granting to the court (should it be satisfied of its jurisdiction) the privilege of rendering judgment in any case referred to it under the Bowman Act and of reporting its proceedings to Congress, which report also includes any facts bearing on the removal of legal obstacles to the liquidation of a claim. Any claim that under the Bowman Act may be dismissed for want of jurisdiction may be referred under the Tucker Act. Consult Hinds, A. C., ‹Precedents› (1899); House Document 576, 55th Congress, 2d session (1899).

BOWMAN'S ROOT, *Porteranthus stipulatus,* a hardy perennial herb of the family *Rosaceæ,* two to four feet tall, found in rich woods from New York to Georgia and sometimes planted in shrubberies for its graceful foliage and numerous terminal clusters of white or rose-tinted flowers. The name is also applied to its close relative, *P. trifoliatus,* which has the same range and bears a rather close resemblance to it. Both species are also called Indian physic, American ipecac, Indian hippo, and have been used as tonics and emetics. They are the only species of their genus.

BOWMANVILLE, Canada, a town in Durham County, Ontario, on north shore of Lake Ontario, 42 miles northeast of Toronto, on the Grand Trunk, Canadian Pacific and Canadian Northern railways. It has important industries, tire and rubber works employing 700 hands, piano manufactory, foundry, flour and barley mills, a glove factory and canning works. Pop. 2,814.

BOWNE, bown, **Borden Parker,** American philosophical writer: b. Leonardville, N. J., 14 Jan. 1847; d. 1910. He was graduated at New York University in 1871 and studied at Halle and Göttingen. He was religious editor of the New York *Independent* 1875–76, becoming professor of philosophy at Boston

University in 1876. He wrote ‹Philosophy of Herbert Spencer› (1874); ‹Metaphysics› (1882); ‹Principles of Ethics› (1892); ‹The Christian Life› (1878); ‹The Atonement› (1900); ‹The Immanence of God› (1905); ‹Kant and Spencer, a Critical Exposition› (1912).

BOWRING, Sir John, English statesman and linguist: b. Exeter, 17 Oct. 1792; d. there, 23 Nov. 1872. While still very young he entered a business house in his native town and in 1811 became clerk to a London firm, on whose business he traveled to Spain. Soon afterward he started on his own account and made many journeys to the Continent. Having extraordinary linguistic ability he made use of his residence in foreign countries to acquire the different languages and his first publications consisted of translations, especially of the popular poetry of many of the countries he had visited. At the same time he appeared as a supporter of the Radical politics of the time and of the views of Jeremy Bentham, whose works he edited, and acted as first editor of the *Westminster Review* from 1824 till 1830. His public life began in 1828, when he was sent to Holland to make a report on the public accounts of that kingdom. His letters from there, which appeared in *The Morning Herald* and were afterward translated into Dutch, procured for him the degree of doctor of laws from the University of Groningen. He afterward received similar commissions to France, Switzerland, Italy, Egypt, Syria and Germany and the Blue-books which appeared from his pen on these separate occasions are considered as models of their kind. He was member of Parliament for the Kilmarnock burghs from 1835 to 1837 and for Bolton from 1841 to 1849. In the year last mentioned he accepted the lucrative post of consul at Canton and his services during the four years that he held this post were so appreciated by the ministry that in 1854, the year after his return, he received the honor of knighthood and was appointed governor of Hongkong. As governor of Hongkong he acted with the same energy that he had manifested when consul at Canton; but the step which he took in ordering Canton to be bombarded to punish the Chinese for an insult offered to the British flag, although approved by Lord Palmerston, then at the head of the government, led to his recall March 1857. The last public commission he received was in 1860, when he was sent to Italy to report on the commercial relations with the new kingdom. He published ‹The Kingdom and People of Siam›; and his ‹Autobiographical Reminiscences› appeared in 1877. He will, perhaps, be longest remembered as the author of the familiar hymn, ‹Watchman, Tell Us of the Night.›

BOWS AND ARROWS. These weapons were used for distant attack and for hunting. Bows are differentiated into two classes: Simple and composite, according to whether they are composed of one piece or made up of several parts or pieces. The history of bows and arrows dates back to prehistoric times and their use can be termed universal. In modern nomenclature bows made of a single piece have been termed «self-bows»; when constructed by gluing several strips together they are known as «union» bows. True African bows are of the simple kind as are also those in South America. The composite bow belongs to Europe, Asia, North Africa, North America and to the Arctic dwellers.

The bow of ancient Greece was composed of two curved ibex horns jointed together by a straight handle-piece. The Romans did not arm their soldiery with bows but they employed the notedly expert Cretan archers as auxiliary troops. Bows were used by the ancient Assyrians and Chaldeans and Egypt shows her archers in Thebes bas-relief. The Syrians, Huns and Parthians used bows, but Franks, Germans, Goths held the bow and arrow in low esteem for defense. As Mohammed raised the use of bows and arrows to a religious duty, it became the favored defensive and offensive weapon of the Persians, Turks and Arabs. See Arms.

In the Middle Ages Europeans, in general, used the bow mostly for the chase. But with the English the *long-bow* has ever been a favorite weapon of the soldiery. The English archers were one of the most effective forces, with their long-bows, in the successful campaign in northern France. The English long-bow was formed of yew and was five feet in length, having a range of 240 yards, discharging sharp, barbed arrows. Twelve shots a minute was the usual expert's speed. They used «bracers» on the forearm to protect from injury by the bow-string. The maker of arrows (arrowsmith) for the army was known as a *fletcher,* from which trade arose the family name.

The material from which bows were made varied with regional conditions. In the far North most bows are of birch and pine combined. Turkish-Indian bow construction was of layers of wood, horn and sinew attached firmly together. Some bows have been found made entirely of whalebone.

One of the constellations is known as Sagitta (the arrow). The zodiacal sign Sagittarius is an archer. In ancient mythology the bow is Apollo's and Diana's weapon. In art Cupid is ever armed with a bow and quiver of arrows. In Christian art the arrow is symbol of pestilence, death and destruction; it is the attribute of the saints Sebastian, Ursula and Christian. In ceramics a bow is one of the marks of the Bow porcelain factory.

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Clement W. Coumbe.

BOWSER, Edward Albert, American mathematician: b. Sackville, New Brunswick, 18 June 1845; d. 1910. He was graduated at Rutgers College in 1868 and in 1871 was appointed professor of mathematics and engineering there. In 1875 he became director of the United States Coast and Geodetic Survey of New Jersey. He published 'Analytical Geometry' (1880; 10th ed., 1888); 'Differential and Integral Calculus' (1880; 9th ed., 1887); 'Analytical Mechanics' (1884); 'College Algebra' (1888); 'Academic Algebra' (1888); 'Plane and Solid Geometry' (1890); 'Elements of Trigonometry'; 'Treatise on Trigonometry' (1892); 'Logarithmic Tables' (1895); 'Hydromechanics' (1885); 'Roofs and Bridges' (1898).

BOWSER, William John, British Columbia statesman: b. Rexton, N. B., 3 Dec. 1867. He was educated at Mount Alison Academy and at Dalhousie University, Halifax, N. S.; became a barrister of New Brunswick in 1890; removed to British Columbia and qualified in that province in 1891. He was elected as a Conservative for Vancouver to the provincial assembly in 1904, appointed attorney-general 1907, became acting minister of finance 1909–10 and premier in 1915, holding office until the defeat of his ministry in the elections of 1917. He was succeeded by H. C. Brewster.

BOX (*Buxus*), a genus of about 30 species of evergreen shrubs or small trees of the family *Buxaceæ,* natives of northern Africa, southern Europe, Central America and similar climates in Asia. The species have small opposite leaves, inconspicuous monœcious flowers in terminal or axillary clusters, and nearly globular fruits containing six shining black seeds. Several species are planted for ornament as edgings of borders, as hedges and as individual specimens, especially for trimming into fantastic shapes, for which purpose some of them are particularly adapted since they stand shearing well. They are of slow growth and are not very hardy where the winters are at all severe. They are propagated by cuttings. *B. sempervirens,* which attains a height of 25 feet or more, has developed several cultivated varieties of which dwarf box, a favorite edging plant, is probably the best known. The very hard, heavy, light yellow wood, exported largely from Spain and Portugal, is highly valued for turning, carving and engraving and for making musical instruments such as flutes, clarionets, etc. The bright yellow wood of *B. balearica,* a larger species than the preceding, native of Turkey and certain islands of the Mediterranean, is largely exported from Constantinople for similar purposes to those of the first mentioned, but is inferior. The leaves are sometimes used medicinally.

BOX AND COX, a farce by John M. Morton, the chief characters being the two men from whom the play takes its name. Box and Cox rent from a certain Mrs. Bouncer the same room, but for some time remain ignorant of the fact, as one works by day and the other by night. A holiday discloses the situation, which mutual agreement leaves unaltered.

BOX-CRAB, a large thick-shelled crab (*Calappa flamma*), occurring from North Carolina southward, and not uncommon on the Florida reefs. It is four or five inches across, about an inch and a half deep, with large broad, flat claws, which are folded closely in front. It is admirably adapted to resist the violence of the surf.

BOX-ELDER, or **ASH-LEAVED MAPLE,** trees of the family *Aceraceæ,* common from the Atlantic coast to the Rocky Mountains. They sometimes attain a height of 70 feet, bear pendulous corymbs of staminate flowers and drooping racemes of pistillate blossoms before the pinnate leaves appear. The wood is inferior for any purposes except for making wood pulp, bowls, pails, etc. It has become very popular in the western United States for windbreaks, fuel and shade, for which its rapid growth and hardiness especially adapted it. It is excellent also to protect other trees until they can care for themselves.

BOX TURTLE, or **TORTOISE.** In the chelonians of the genus *Cistudo,* and to a less extent in *Emys,* the plastron or lower shield is not rigidly attached to the carapace or upper shield, but is jointed to it by an elastic cartilage. Furthermore, the plastron itself is made up of a front and a rear part, hinged together with cartilage. The animal is consequently able to enclose itself in a sort of box, and is hence known as a *box turtle* or *tortoise.* In Cistudo this box is almost perfectly sealed. *Emys* contains two species, both semi-aquatic in habits, Blanding's or the semi-box turtle in the northeastern part of the United States, and the European pond turtle in central and southern Europe, the northern edge of Africa and Asia Minor. *Cistudo* is found in the central and eastern parts of the United States, with the exception of one Mexican species. It is completely terrestrial, but the hind feet, which possess three or four claws, show traces of webs. There is a superficial resemblance between the box turtles and the species of *Testudo,* the true tortoises, in the arched shell, the stumpy forelegs and the slow gait. (See TURTLE.) Consult Ditmars, R. L., 'Reptiles of the World' (New York 1910).

BOXBERRY. See GAULTHERIA.

BOXER, The. See ENTERPRISE, THE.

BOXERS (and Boxer Rebellion), the name given to the members of a powerful secret society in China. Its avowed object is the driving out from China of all Europeans or other foreigners. The Chinese name for the association is I-ho-ch'uan, which is variously rendered in English. The active efforts of American and European missionaries and the constant encroachments upon Chinese territory by European countries appear to be responsible in great measure for the establishment of the society. The events which precipitated the first demonstrations of the Boxers were the occupation of Kiao-Chau by Germany, the acquisition of Port Arthur by Russia, the taking of Wei-Hai-Wei by England and the French seizure of Kwang-Chau. Thus the Boxer movement presents itself largely under the aspect of a patriotic uprising against foreign aggression, a fact which goes far to account for the rapidity and thoroughness of its operations in 1900. Early in that year the native population in Shantung were found to be rallying around the standard of the Boxers and adopting its motto, «Uphold the dynasty, drive out the foreigners.» The diplomatic corps at Peking called upon the imperial government to suppress the movement.

This the court professed its readiness to do, although there was a suspicion, voiced by the British Minister, that the Empress Dowager had fallen under the influence of a native party led by T'ung Fuhsiang and Yu-hsien, and was temporizing with the Boxers. In May 1900 the Boxers began a concerted movement upon the Chinese capital, which, notwithstanding the protests of the diplomatic corps, remained unchecked by the military forces of the empire. These forces being Manchu troops, their loyalty was open to question and their sympathies were alleged to be with the Boxer movement. This, at any rate, was the only explanation offered by the Chinese government for its failure to cope with the uprising. The situation had been rendered additionally threatening by the action of the allies in opening fire upon the forts at Taku. On 17 June the warships of the powers were in force at that port; when fired upon by the Chinese they opened a bombardment. The demonstration before Taku had been deprecated by the United States commander, Admiral Kempff, who did not participate in the bombardment. His warnings that hostilities would unite Chinese against the foreigners were justified by events.

In June 1900, Peking was reduced to a state of siege by the Boxers. The position of the foreigners in the capital became precarious. The entire diplomatic corps was cut off from communication with the outside world. In the emergency the powers hurried military and naval forces to the scene, and an international relief column, under the command of Admiral Seymour of the British navy, moved upon Peking. This force was, however, compelled to retreat, when a short distance beyond Tien-Tsin, with a loss of 300 men. The position of the capital now became desperate. Cut off from communication with the rest of the world, Peking was a scene of turbulence and the centre of wild rumor. It was reported that on 7 July the entire diplomatic corps had fallen a prey to Boxer fury. This rumor was later discredited, the aspect of affairs having been rendered incomprehensible by the receipt of a despatch purporting to emanate from United States Minister Conger, and bearing date 18 July. According to this despatch the diplomatic corps had taken refuge in the British embassy, where they remained in a state of siege by the Boxers, anticipating massacre unless speedily relieved. Meanwhile the allies had concentrated their forces upon Tien-Tsin, capturing the place in the middle of July, but suffering severe loss. The 9th Regiment, United States army, had many casualties, including the loss of its colonel and other officers. The movement had spread in all directions among the Chinese, who on 16 July invaded Siberia. Russia at once proclaimed a state of siege in its Asiatic dominions. The powers did not, as yet, give formal recognition to a state of war, chiefly in consequence of the attitude of the United States, which took the ground that the Chinese government had been overpowered by an insurrectionary movement. On 20 July the powers made a categorical demand to be placed in communication with their diplomatic representatives. The authorities at Peking professed their readiness to comply at the earliest possible moment. The international situation was more clearly defined on 23 July by the appeal of China to the United States for the good offices of the latter in dealing with the powers. See CHINA.

BOXING, as now practised and popularly defined, is a contest of skill, endurance and pluck between two contestants striking at each other with the closed hand, or fist, covered with a soft leather glove stuffed with horsehair. Contests of this nature in various forms are probably coeval with man. The sport was much in vogue among the Greek and Roman athletes, but in place of the modern tendency to deprive it of its more brutal characteristics, as by the use of gloves, the ancients made the punishment as severe as possible by arming the fists of the combatants with strips of rawhide (the *cestus*), which were often knotted and loaded with lead or iron. In the first half of the 18th century rules were formulated to govern such contests in England, and from that time onward the practice of fighting with the fists for prizes or for championships has been reduced well-nigh to a «science.» Methods of striking, ring tactics, etc., have developed until mere brute force has had to give way before intelligence; in other words, the head has defeated the hands.

In 1719 one Figg, an English pugilist, who attained such celebrity as to have his portrait painted by Hogarth, brought about some system in the conduct of the prize-ring. His work was continued by Broughton, himself for many years champion of England and a great upholder of the sport. Regular contests were held, with prizes of money and an emblem of championship, usually a belt, which was held on the condition of meeting all comers, on penalty of surrendering it if declining the trial or beaten by the adversary. The use of a belt as such emblem is of very ancient origin, dating back at least to the time of the siege of Troy. Homer, in describing the games at the funeral of Patroclus, mentions a belt in this connection. There is an unbroken record of championships from the time of Figg down. But since 1860, when the British champion, Tom Sayers, fought the American John C. Heenan, fighting with bare knuckles, which had hitherto been the custom, was suppressed, and in its place the use of gloves was adopted. The laws were, however, frequently evaded by the use of skin-tight gloves. At the present time gloves weighing four ounces are used for championship matches.

With the use of gloves came also the adoption of new rules, named, from their framer's title, the Marquis of Queensbury's rules. Under these wrestling and hugging (which had previously been permitted) were prohibited; the time of each round was limited to three minutes, with intervals of one minute between each round; and the former space of 30 seconds within which a man knocked off his feet might recover himself and be brought back to the fighting line was reduced to 10 seconds.

Under the new conditions boxing has taken a leading rank as a sport and exercise. In the former aspect legislation has been found necessary to restrict its tendency to degenerate into brutality and to lend its aid to gambling and other vices. As an exercise, however, it holds a high place. It is considered the best system of gymnastics for bringing all the limbs under perfect command; rendering every part of the body pliant, flexible and firm; acquiring a perfect power of keeping the true centre of gravity in every position, and of extending the body and limbs to the extreme length and recovering again without pause or difficulty; and developing the power of breathing and the «staying» qualities. The practice of boxing also gives to those proficient in it a remarkable power of calmly looking danger in the eye, and preserving both the temper and the courage under trying circumstances unruffled. It is alleged by the defenders of this sport that it encourages individual and therefore national courage; that it leads to a general sense and sentiment of fair play and honor, and that it discourages and renders infamous the use of the knife and other deadly weapons.

Amateur boxers are divided into seven classes considered according to weight — 105 pounds, 115, 125, 135, 145 and 158 pounds, all over the latter weight being classed as «heavy» weights. Among the lighter weights the classes are sometimes termed «bantam» weights, «feather,» «light» and «middle» weights. The term «catch weights» implies no restriction as to weight.

The laws governing the practice of the sport vary in different States of the Union and in Great Britain and cannot be accorded space here. For the rules and history of boxing consult Doran, B. J., ‹Science of Self-Defense› (Toronto 1893); Earl, ‹Handbook of Boxing› (1893); Egan, P., ‹Boxiana, or Sketches of Ancient and Modern Pugilism› (4 vols., London 1818–24); Lynch, ‹The Complete Amateur Boxer› (London 1913); Mitchell, C., ‹Boxing› (Badminton Library 1889); Spalding's Athletic Library, ‹Boxing› (New York, published annually).

BOXING THE COMPASS, the recital of all the points of the compass in their proper order, and is among the lessons which a young sailor has to learn.

BOXING-DAY, in England, the day after Christmas, so called from the practice of giving Christmas-boxes or presents on that day. It was made a bank holiday by the act of 1871. The practice has of recent years been considered a nuisance and in 1836 was actually legislated against, so far as government employees were concerned. Consult Brand, ‹Popular Antiquities› (ed. by Ellis, 3 vols., London 1843).

BOXTHORN. See LYCEUM.

BOY BISHOP, a boy chosen on Saint Nicholas' Day, 6 December, by the votes of his fellow-choristers, to act the part of bishop, retaining office until Saint Innocent's Day, 28 December. This custom of the mediæval Church, as practised in England, extended to the schools of Winchester and Eton. Dressed in the episcopal vestments, with mitre, crozier and ring, the youthful bishop went about attended by a dean and prebendaries and followed by children; went through the forms of blessing and of preaching, more to the entertainment than edification of his hearers. Boy bishops dying during their incumbency were buried in their episcopal attire. The custom of electing a boy bishop came to an end in England during the reign of Queen Elizabeth. Consult Walcott, ‹Sacred Archæology› (London 1868).

BOY SCOUTS. These are organizations of boys and youths between the ages of 12 and 18 years and upwards, which aim to develop character, to aid in furnishing equipment for a career and to train in service for others, physical health and efficient citizenship, by utilizing the natural activities and interests of the adolescent period.

The development of the boy scout movement in England is due to Lieut.-Gen. Sir Robert S. S. Baden-Powell (q.v.), who, during the siege of Mafeking (1899), had seen the boys, under Lord Edward Cecil's command, organized and drilled into an efficient messenger service. When Baden-Powell returned to England, in 1902, the idea was fostered and received popular support and a general plan of organization was adopted. The first boy scouts' organization was formed in 1908 and a royal charter of incorporation was granted in 1910, the organization being recognized as a «non-military, public service body.»

In the United States, Daniel Carter Beard, with his «Sons of Daniel Boone,» Ernest Thompson Seton, with the «Woodcraft Indians» (1902), and others had much to do with the early success of the movement, their ideas, in conjunction with those of Sir Robert, forming the basis of the Boy Scouts of America. This organization was incorporated under the laws of the District of Columbia 8 Feb. 1910.

The Boy Scouts of America is non-military and inter-denominational in character, the movement being supported by Catholics, Protestants and Jews alike. Of late it has also been given consideration as an educational adjunct by well-known educators, some schools adopting the scout program in part or as a whole, while a number of universities and colleges conduct special courses for scoutmasters and scout officials.

The administration of the Boy Scouts of America is in the hands of a National Council, working through an executive board. The Council includes many men of national prominence and has the President of the United States as honorary president and the ex-Presidents of the United States as honorary vice-presidents. The national headquarters is at 200 Fifth avenue, New York city, where are issued the official publications, *Boys' Life,* the Boy Scouts' magazine, issued monthly, and *Scouting,* a semi-monthly bulletin for scout officials.

Local councils are organized to supervise and extend the movement in communities upon application by representative citizens to national headquarters. Each local council works through an executive committee and a commissioner, with a paid executive employed when development makes it necessary for one man to give his entire time.

The scouts themselves are organized into patrols of eight boys, three or four patrols forming a troop under a scoutmaster. Each troop has also a committee of three or more men, representing the school, church, settlement house, playground or other institution with which it is connected. This committee recommends the selection of the scoutmaster to the local council, or to the national headquarters direct when there is no local council, and co-operates with him. Any boy of 12 or older may become a scout upon fulfilling certain conditions. These include taking the scout oath, which reads as follows: «On my honor I will do my best — (1) To do my duty to God and my country, and to obey the scout laws; (2) To help other people at all times; (3) To keep myself physically strong, mentally awake and morally straight.» He also subscribes to the 12 points of the Scout Law. A Scout is trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean and reverent. The motto of the organization is «Be prepared,» and the principle, «Do a good turn daily,» is kept constantly before the boys.

Scouts are divided into three classes — tenderfoot, second class and first class scouts. Promotion in these classes is conditioned on passing certain requirements, after which the goal is the attainment of merit badges given for special proficiency in such subjects as first aid, life-saving, civics, tracking, signaling, cycling, nature study, seamanship, campcraft, woodcraft, the handicraft, etc. In all 57 merit badges are provided. When a first class scout earns merit badges for first aid, physical development or athletics, personal health, public health and life-saving or pioneering, he becomes a life scout. When a first class scout qualifies for 10 merit badges, including the five badges of the life scout, he becomes a star scout; and when a first class scout has qualified for 21 merit badges, including first aid, life-saving, personal health, public health, cooking, camping, bird study, path-finding, pioneering, athletics or civics, physical development and any 10 others, he becomes an eagle scout. Special honor medals in bronze, silver and gold are given for lifesaving.

A book department is maintained by the national organization which, with the assistance of a library commission composed of expert book men, makes available reliable advice as to worth-while books for boys and, under the leadership of this department, arranges with publishers for reprint editions of the best books for boys at low prices. The results of this department in the shape of definite lists carefully subdivided are made available without any charge to librarians, local councils, troops and parents of boys throughout the country. Many hundreds of parents are already being given special advice as to courses of reading for their boys.

In 1914, in Great Britain and the British colonies, there were over 200,000 scouts and scoutmasters; and in the United States there were, on 15 May 1916, 174,000 scouts registered with the national headquarters and in good standing, together with 8,323 scoutmasters and about 34,000 other scout officials, all in good standing, making a total of about 215,000 scouts and scout officials. Scouting is established in nearly every country of continental Europe, with a total membership numbering more than 1,000,000.

BOYACA, bō-yä-kä', Colombia, a department of that republic containing 17,654 square miles, bounded on the north by Santander and Venezuela, on the south by Meta and on the west by Cundinamarca and Antioquia. It lies chiefly on the high plateau of the eastern Cordillera, with a narrow prolongation on the plains between Venezuela and Meta. The capital is Tunja, of 8,500 inhabitants. The land is extensive in prairies, covered with marshes and forests, with scattered pastures and cultivated ground, watered by tributaries of the Orinoco and the Meta. The lowlands are fertile and among the mountains various minerals are found and the emerald mines of Murzo have long been famous. The people have rude manufactures of cotton, wool, straw, etc., but cattle raising is the chief occupation. The inhabitants, chiefly Indians and Mestizos, occupy only a small part of the state and number about 586,500.

BOYACA, town of Colombia, South America, 25 miles south of Tunja, in the state of Boyacá, and about 60 miles northeast of Bogota. It is inhabited mostly by Indians, contains extensive lime-kilns and was the scene of a battle, 7 Aug. 1819, between the Spaniards and General Bolivar, which resulted in the defeat of the former and the establishment of Colombian independence. A college was established here in 1821. Pop. 7,000.

BOYAR, or **BOIAR**, among the Slavic nations, a free landowner independent of any sovereign. It is synonymous with *cech, lech* or *bajarin*, used by several Slavic tribes, such as the Bohemians and Poles. The word Boyar was at first especially used by the Bulgarians, Serbs and Russians and then was adopted by the Moldavians and Wallachians. It represented the highest social condition, corresponding in certain respects to that of an English peer. In ancient Russia, the boyars were the next after the princes of the blood, or *knazia*, who were all originally petty sovereigns. The boyars formed a kind of supreme political body in the state and acted as the council (*duma*) of the grand dukes. All the higher offices, civil and military, including the lieutenancies in the provinces, were held by them. While Russia was still divided into several petty sovereignties, the boyars enjoyed the right of choosing for themselves and for their dependents the prince whom they wished to serve and to leave the service at their pleasure, without any previous notification. When the grand dukes of Vladimir and of Moscow stripped these petty princes of their sovereign rights and transformed them from vassals into subjects, the dignity of boyars was granted to their families. The boyars had their own military retinue and their clients; and their influence on the masses of the people often equaled that of the grand dukes. The sovereign ukases always contained the sacramental words, «ordered by the Grand Duke (subsequently it was ‹by the Tsar›), and approved by the boyars.» Precedence among the boyars was reckoned according to the date of the title, which was hereditary, and the observance of it was carried so far that in the 16th and 17th centuries any boyar of an older creation refused to serve under a younger one. This struggle for rank was ended by the Tsar, Alexis Michailovitch Romanoff, who destroyed the official records and diplomas of the boyars, but they retained their place among the nobility. Peter the Great wholly abolished their power and official privileges and the name now remains only as a historical distinction and a recollection of the past, in families which once possessed the dignity. In Rumania boyars still exist, though the title has only the significance of the English «squire,» or owner of an estate.

BOYCE, James Petigru, American clergyman: b. Charleston, S. C., 11 Jan. 1827; d. Peau, France, 28 Dec. 1888. He was graduated at Brown University in 1847 and studied theology at Princeton from 1849 till April 1851. He was ordained to the ministry in December of the latter year and settled at Columbia, S. C. In 1855 he became professor of theology in Farman University. He was elected professor in the Southern Baptist Theological Seminary at Greenville, S. C., February 1858, and entered upon the duties of the office in October 1859. The operations of the seminary having been practically suspended during the Civil War, he entered the confederate army as a chaplain and served in that capacity for six months. He was elected to the legislature of South Carolina in 1862 and re-elected in 1864. In 1863 he devised a plan for extinguishing the Confederate debt and was appointed a special commissioner to secure its adoption. After the war he gave his attention to the resuscitating and re-establishing the Southern Baptist Theological Seminary in Kentucky, and in 1874, secured pledges to the amount of $90,000 for the support of the seminary. For several successive years he was president of the Southern Baptist Convention. He contributed frequently to current literature and published several volumes of sermons and addresses. He received the degrees of S.T.D and LL.D. from Columbian and Union (Tenn.) Universities, respectively.

BOYCOTT. What is popularly known as the boycott is a form of coercion by which a combination of many persons seek to work their will upon a single person, or upon a few persons, by compelling others to abstain from social or beneficial business intercourse with such person or persons. Carried to the extent sometimes practised in aid of a strike it is a cruel weapon of aggression and its use immoral and anti-social, and the concerted attempt to accomplish it is a conspiracy at common law and merits and should receive the punishment due to such a crime. It is attempted to defend the boycott by calling the contest between employers and employees a war between capital and labor and pursuing the analogies of the word to justify thereby the cruelty and illegality of conduct on the part of those conducting a strike. The analogy is not apt and the argument founded upon it is fallacious. There is only one war-making power recognized by our institutions and that is the government of the United States and of the States in subordination thereto when repelling invasion or suppressing domestic violence. War between citizens is not to be tolerated and cannot in the proper sense exist. If attempted it is unlawful and is to be put down by the sovereign power of the State and nation.

The practices common in a boycott would be outside the pale of civilized war. In civilized warfare, women and children and the defenseless are safe from attack and a code of honor controls the parties to such warfare which cries out against the boycott. Cruel and cowardly are terms not too severe by which to characterize it.

The name was first given to an organized system of social and commercial exclusion employed in Ireland in connection with the Land League and the land agitation of 1880 and subsequently. It took its name from Capt. James Boycott, a Mayo landlord, one of its earliest victims, who as agent for Lord Erne evicted many tenants. A landlord, manufacturer or other person subjected to boycotting faces a combination to prevent his buying from or selling to anyone employing labor, etc., and those refusing to join in a boycott are often threatened with similar interference, loss or injury. Boycotts have been frequently employed in the United States as a means of coercion in labor difficulties. The attitude of courts is not altogether uniform in regard to such combinations. A boycott accompanied by violence is a criminal offense and such conspiracy is sometimes declared unlawful even when not marked by threats and violence.

English courts recognize the legality of the boycott, no matter how much injury it may inflict on its victims, and punish only acts of violence or intimidation that may be incidental to the boycott. In the United States, however, the courts usually take a strong attitude against boycotting and in Alabama, Colorado, Illinois, Indiana and Texas it is especially prohibited by legislation, regardless of what its object may be or whether it is accompanied by violence. Many cases have been brought before the United States Supreme Court under the Sherman Anti-Trust Act, notably the Danbury Hatters' and the Bucks Stove Company cases. In both cases the court decided that boycotts were «in restraint of trade,» therefore illegal.

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BOYD, Andrew Kennedy Hutchison, Scottish clergyman and author: b. Auchinleck, Ayrshire, 3 Nov. 1825; d. London, 2 Nov. 1899. He was educated at King's College, London, and Glasgow University; was ordained in 1851, and was incumbent successively of the parishes of Newton-on-Ayr, Kirkpatrick-Irongray, in Galloway, Saint Bernard's, Edinburgh, and at the university city of Saint Andrews. He early became known as a contributor to *Fraser's Magazine,* under the signature «A. K. H. B.» Many of these contributions were reprinted in book form under the title 'Recreations of a Country Parson,' of which three series appeared. In 1890 he was moderator of the General Assembly of the Church of Scotland. He also published 'Graver Thoughts of a Country Parson,' 'Counsel and Comfort Spoken from a City Pulpit,' 'Present-Day Thoughts,' 'Memorials of Saint Andrew's Sundays,' 'Toward the Sunset,' 'What Set Him Right,' 'The Best Last,' 'Twenty-Five Years of Saint Andrews,' 'Saint Andrew's and Elsewhere,' etc.

BOYD, Sir John Alexander, Canadian judge: b. Toronto, 23 April 1837. Educated at Upper Canada College and Toronto University, where he was graduated in 1860. He became Chancellor of Ontario 1881, and president of the High Court of Justice for Ontario

1887. He is the author of a ‹Summary of Canadian History,› and was created K.C.M.G. in 1901.

BOYD, John Parker, American soldier: b. Newburyport, Mass., 21 Dec. 1764; d. Boston, 4 Oct. 1830. His father came from Scotland and his mother was a descendant of Tristam Coffin, the first of that family who emigrated to America. He entered the army in 1786 as ensign in the 2d regiment, but peace service did not suit his adventurous spirit and in 1789 he went to India. Under Nizam Ali Khan he was given an important command in Madras and at one time had an army of 10,000 men at his disposal. He remained in India several years, in a sort of guerilla service, and obtaining much favor. Returning home in 1808, he was appointed colonel of the 4th regiment, United States army. He took part in the battle of Tippecanoe, November 1811; was made brigadier-general, 26 August, and held that rank throughout the War of 1812. He was at the capture of Fort George and in the battle of Chrysler's Field, Canada. In 1816 he went to England to secure indemnity for the loss of a valuable cargo of saltpetre captured by an English cruiser, but procured only a single instalment of $30,000. President Jackson appointed him naval officer at Boston in 1830, but his services were almost immediately cut short by his death. He published a pamphlet, ‹Documents and Facts Relative to Military Events During the Late War› (1816).

BOYD, Linn, American statesman: b. Nashville, Tenn., 28 Nov. 1800; d. Paducah, Ky., 16 Dec. 1859. While he was a boy his parents removed to Trigg County, Ky., where he was brought up to work on the farm and could only attend school in winter. At 26 years of age he had a farm of his own in Calloway County, and, notwithstanding his slender education, was elected to represent that county in the legislature for successive terms from 1827 to 1830. Returning to Trigg County, he was again sent to the legislature in 1831–32. He was a Democrat in politics and, after a defeat by a Whig candidate in 1833, was elected to Congress in 1835. He was defeated for the 25th Congress but elected for the 26th, and from 1839 till 1855 regularly re-elected to the national House of Representatives. His native abilities soon made him prominent in the House and he became chairman of the Committee on Territories, and on 31 Dec. 1851 was chosen speaker, which office he held until 1855. He was lieutenant-governor of Kentucky for a year before withdrawing from political life, and when he finally retired it was with a high reputation for faithfulness in every public trust.

BOYD, Thomas Duckett, American educator: b. Wytheville, Va., 20 Jan. 1854. He was graduated at Louisiana State University in 1872 and held important posts in the faculty of that institution 1873–88. He was president of the Louisiana State Normal School 1888–96. Since 1896 he has been president of the Louisiana State University. He has been an active member of various State and national educational associations.

BOYD, Zachary, Scottish divine: b. Ayrshire, about 1586; d. about 1653. He received the rudiments of his education at Kilmarnock School and took the academical course in the University of Glasgow. About 1607 he went abroad and studied at the College of Saumur, France. He was appointed a regent in this university in 1611 and is said to have been offered the principalship, which he declined. He spent 14 years in France, during four of which he was a preacher of the gospel. In consequence of the persecution of the Protestants he was obliged to return home in 1621. There he lived successively under the protection of Sir William Scott of Elie and of the Marquis of Hamilton at Kinneil, it being then the fashion for a pious person of quality in Scotland to retain one clergyman at least as a member of his household. In 1623 he was appointed minister of the large district in the suburbs of Glasgow, styled the Barony parish, for which the crypts beneath the cathedral church then served as a place of worship. In this charge he continued for the rest of his life. He filled the office of rector of the University of Glasgow 1634–35 and 1645. In 1629 he published his principal prose work, ‹The Last Battell of the Soule in Death; whereby are shown the Diverse Skirmishes that are between the Soule of Man on his Deathbed and the Enemies of our Salvation carefully digested for the Comfort of the Sicke.› This was reprinted at Glasgow in 1831, with a life of the author by Mr. Neil. He published various other works, chiefly devotional, and left a large quantity of manuscript writings, which are preserved in the Glasgow College library. Among the latter is one entitled ‹Zion's Flowers,› consisting of poems on select subjects of Scripture history. It is popularly called ‹Zachary Boyd's Bible,› and although it abounds in homely and ludicrous passages, it is not without a fine strain of devotional feeling. Boyd left a large legacy to the Glasgow College.

BOYDELL, John, English engraver, more distinguished as an encourager of the fine arts than on account of his own productions: b. Darrington, Shropshire, 19 Jan. 1719: d. 12 Dec. 1804. He was intended for his father's occupation, which was that of land-surveyor. Accident having thrown in his way Baddeley's ‹Views of Different Country Seats,› he conceived so strong an inclination for engraving that he determined to adopt it as a profession; and accordingly, when above 20, he bound himself apprentice for seven years to W. H. Towns, a London engraver. In 1745 he published six small landscapes, and afterward executed as many more views of places in and near London as formed a volume, which he published by subscription. With the profits of this work he established himself as a printseller, and by his liberality to artists in general established a high reputation as a patron of ingenious men. Woollet was employed by him to engrave the celebrated pictures of Niobe and Phaeton, and he furnished other eminent artists with occupation, and was thus enabled to carry on an extensive foreign trade in English prints, which tended greatly to his own emolument and to the credit and advantage of his native country. Having at length established what may be termed an English school of engraving, he next turned his attention to the improvement of the art of painting. With that view he engaged the first artists in the kingdom to furnish the collection of pictures forming the well-known Shakespeare Gallery. The wars arising out of the French Revolution having obstructed his continental trade, he was induced in 1804 to solicit an act of Parliament to permit him to dispose of his gallery and paintings by lottery. This he obtained, and lived long enough to see every ticket disposed of, but died before the lottery was drawn. In 1782 he was elected alderman and in 1790 Lord Mayor. Sir Joshua Reynolds called him «the commercial Mæcenas of England.»

BOYDEN, Seth, American inventor: b. Foxboro, Mass., 17 Nov. 1785; d. Middleville, N. J., 31 March 1870. He was brought up on a farm, and attended a district school. Mechanically inclined, he spent much time experimenting in a blacksmith shop. His first invention was a machine for making nails, and in 1809 he undertook to manufacture both nails and files. Soon afterward he invented a machine for splitting leather, and in 1815, he took it to Newark, N. J., where he engaged in the leather business. In 1816 he invented a machine for cutting brads, and followed this by the invention of patent leather, which he manufactured till 1831, when he began making malleable iron castings, on a system of his own. Another invention was one for making hat bodies and a process for making Russia sheet iron. In 1835 he turned his attention to steam engines; substituted the straight axle for the crank in locomotives; and invented the cut-off now used instead of the throttle valve. In 1849 he went to California, but was unsuccessful, and returned to New Jersey, where he applied himself to farming, and developed a variety of strawberry previously unequaled in size or quality. In 1890, a statue was erected to his memory in Washington Park, Newark, N. J., where he spent the greater part of his life.

BOYÉ, Martin Hans, Danish-American chemist and genealogist: b. Copenhagen, Denmark, 6 Dec. 1812; d. 1909. He was a graduate from the University of Copenhagen and from the medical department of the University of Pennsylvania in 1844. He came to the United States in 1836 and jointly discovered several chemical compounds, as well as perchloric ether in 1841. In 1845 he discovered the first process of refining cotton-seed oil. He was professor of chemistry at the Central High School in Philadelphia, 1845–59, retiring in the year last named. He published ‘Pneumatics, or the Physics of Gases’ (1856); ‘Chemistry, or the Physics of Atoms’ (1857).

BOYER, bwä-yā, **Alexis,** French surgeon: b. Uzerches, Limousin, 1 March 1757; d. Paris, 25 Nov. 1833. Although in his younger years he had to struggle against poverty and disease, he attended the lectures of Louis and Desault and after a brilliant career as a student, obtained the degree of master of surgery in 1787. He became successively surgeon to the Hôpital de la Charité and to the Hôtel-Dieu; was professor, first of operative and then of clinical surgery, at the Ecole de Santé, and was appointed first surgeon to Napoleon, receiving at the same time the title of baron of the empire, with a dotation of 25,000 francs. He became a member of the Institute in 1825 and was consulting surgeon to Louis XVIII, Charles X and Louis Philippe. His chief works are ‘Traité d'anatomie’ (1797–99); ‘Traité des maladies chirurgicales et des opérations qui leur conviennent’ (11 vols., 1814–26). He also contributed to the ‘*Journal de médecine*’ and the ‘Dictionnaire des sciences médicales.’

BOYER, Jean Pierre, President of the republic of Haiti: b. Port-au-Prince, 28 Feb. 1776; d. Paris, 9 July 1850. He was a mulatto by birth but came early to Europe, where he obtained a European education. In 1792 he entered the army and joined the blacks, who had risen against the French. After the Commissioners of the French Convention had proclaimed the freedom of the blacks in Haiti (1793) he fought with distinction against the English in San Domingo but was nevertheless obliged to evacuate the island, to which he did not return till 1802. At first he acted as leader of the mulattoes in the war against the negroes, but afterward effected a union between these in order to prepare the way for the complete independence of the island. When Pétion established a free state in the western part of the island, Boyer undertook the command of the troops which were concentrated in Port-au-Prince. After the death of Pétion, Boyer was elected president in 1818. By his skilful military operations, not less than by his adroit diplomacy, he finally succeeded in uniting the eastern part of the island with the republic and thus effecting the complete separation of the island from France and Spain in 1825. He also purified the internal administration, raised the financial condition of the republic and bestowed particular care upon its educational institutions. The contest between mulattoes and negroes, however, still went on and in the end the latter rose in rebellion against him and compelled him to leave the island in 1843. He never returned to the place of his birth and of his long-continued activity, but lived for the rest of his life, first in Jamaica and afterward in Paris.

BOYESEN, boi′ė-sĕn, **Hjalmar Hjorth,** Norwegian-American novelist and writer: b. Frederiksvärn, Norway, 23 Sept. 1848; d. New York, 4 Oct. 1895. After completing his university studies at Christiania, he came to the United States in 1869 and was editor of a Norwegian journal in Chicago. He returned to Europe in 1872 and studied Germanic philology at Leipzig two years; then, returning to this country, he was professor of German in Cornell University (1874–80) and then of Germanic languages and literature in Columbia College till his death. His story of Norwegian life, ‘Gunnar,’ published in the *Atlantic Monthly* (1873) and his ‘Idyls of Norway and Other Poems’ (1883), give proof of his rare imaginative faculty and his deep human sympathies. Besides these, he wrote ‘Tales from Two Hemispheres’ (1875); ‘A Norseman's Pilgrimage’ (1876); ‘Falconberg’ (1878); ‘Goethe and Schiller: Their Lives and Works’ (1878); ‘Ilka on the Hill-Top’ (1881, dramatized 1884); ‘Queen Titania’ (1882); ‘A Daughter of the Philistines’ (1883); ‘Story of Norway’ (1886). Some of his works have been translated into German, etc. He was a founder of the New York Authors' Club.

BOYLE, Charles (4th Earl of Orrery), English physicist: b. Chelsea 1676; d. 28 Aug.

1731. While a student at Christ Church, Oxford, he published a new edition of the epistles of Phalaris, of which Dr. Bentley questioning the authenticity, he wrote an answer entitled 'Dr. Bentley's Dissertation on the Epistles of Phalaris Examined,' which produced the famous Boyle and Bentley controversy. On leaving the university in 1700 he was chosen member for Huntingdon, and on the death of his brother succeeded to the earldom, fought at Malplaquet, was made major-general and was soon after elected a knight of the Thistle. He was subsequently raised to the dignity of a British peer, under the title of Lord Boyle. He retired from court soon after the accession of George I, and in 1722 was sent to the Tower on suspicion of being concerned in Layer's plot, but was discharged after six months' imprisonment. He constantly attended the House of Peers as before but never spoke, though often employed in drawing up protests. Besides the edition of Phalaris, he published a comedy called 'As You Find It,' a copy of verses to Dr. Garth upon his dispensary and a prologue to Southerne's play of the 'Siege of Capua.' His name of Orrery was given to an astronomical instrument invented by Mr. George Graham, whom he patronized.

BOYLE, David, Canadian ethnologist: b. Greenock, Renfrewshire, Scotland, 1 May 1842; d. 1911. He went to Canada in 1856 and was first a blacksmith and then a teacher. He later took up geology and discovered the fossils *murchisonia boylei,* named in his honor. He was for 25 years curator of the Archæological Museum at Toronto. He wrote 'Notes on Primitive Man in Ontario' and similar works.

BOYLE, Horatio Temple Stannage, Canadian educator: b. Saint Catherines, Ontario, 1875. He was educated at Trinity University, Toronto, where he was graduated in 1898, and at Montreal Theological College. Ordained in the Anglican Church in 1900, after holding assistantships at Shawville and Montreal, he was rector of Wingham, Ontario (1905), and Chatham (1908); in 1910 became professor of church history and liturgies at Trinity University, and in 1915 principal of King's College, Halifax, N. S.

BOYLE, John (EARL OF CORK AND ORRERY), son of Charles Boyle: b. 1707; d. 1762. His earliest publication was a translation of two odes of Horace in 1742, which work was followed in 1751 by his 'Translation of the Epistles of Pliny the Younger, with Observations on Each Letter, and an Essay on Pliny's Life.' This translation advanced his reputation as a polite scholar, but has since been eclipsed by the superior version of Melmoth. In 1754 he made the tour of Italy and employed himself in collecting materials for a history of Tuscany, which he intended to write in a series of letters, 12 only of which have been published since his death. They are written in an agreeable manner and contain some curious information respecting the Medici family.

BOYLE, Richard (EARL OF CORK), English statesman: b. Canterbury, 13 Oct. 1566; d. 15 Sept. 1643. In 1588 he went to Dublin with strong recommendations to persons in power, whose patronage he obtained. The state of Ireland at that time having rendered land very cheap, he took advantage of the circumstance to make some considerable purchases, among which was the estate of Sir Walter Raleigh, consisting of 12,000 acres in the counties of Cork and Waterford, which he obtained on easy terms. He was then appointed clerk of the council under Sir George Carew, the president of Munster, whom he accompanied in various expeditions against the Irish insurgents in opposition to the English government. On these and other occasions he distinguished himself by his talents and activity, and rapidly augmented his political power and influence. King James I appointed him privy-councillor for Munster and afterward for the kingdom of Ireland; in 1616 he was made a peer of that realm by the title of Baron Boyle of Youghall, and in 1620 was created Viscount Dungarvan and Earl of Cork. He was now at the height of his prosperity, living in his castle of Lismore in a style of grandeur more resembling that of a sovereign prince than of a private individual. In 1629 he was made one of the lords justices of Ireland and, in 1631, lord-treasurer of that kingdom. Like most of the English rulers of the sister island, he seems to have employed his power rather for the subjugation than the advantage of the native Irish. He built and fortified towns and castles and introduced among the people arts and manufactures, but put in force the severe laws of Queen Elizabeth against the Roman Catholics and transported multitudes of the ancient inhabitants from the fertile province of Leinster to the bogs and deserts of Kerry, supplying their place with English colonists. In 1641 the Earl went to England as a witness against Lord Strafford, then under impeachment, having quarreled with that nobleman during his vice-royalty. Soon after his return home the insurrection of the Irish broke out, on which event he displayed his accustomed activity, enlisting his tenantry under the command of his sons and taking other measures for the defense of the country. Lord Cork is principally memorable as the founder of a family, several individuals of which have highly distinguished themselves as cultivators of literature, science and the arts; yet it should not be forgotten that he attained a high degree of contemporary fame and was designated in the age in which he lived — «The great Earl of Cork.»

BOYLE, Robert, English philosopher: b. Lismore Castle, in the province of Munster, Ireland, 25 Jan. 1627; d. London, 30 Dec. 1691. He was the seventh son and 14th child of Richard, the great Earl of Cork. He was sent to Eton at the age of eight and in 1638 to Geneva, where he continued to pursue his studies for several years, returning to England in 1644. During this period his father had died, leaving him considerable property. He now went to his estate at Stalbridge, where he devoted himself to the study of physics and chemistry. He was one of the first members of a learned society founded in 1645, which at first went under the name of the Philosophical College. On account of the political disturbances this society retired to Oxford, but was revived after the Restoration under the name of the Royal Society. Boyle occupied himself at Oxford in making improvements in the air-pump. Like Bacon, he esteemed observation the only road to truth. He attributed to matter merely mechanical properties. Every year of his life was marked by new experiments. We are indebted to him, indirectly, for the first certain knowledge of the absorption of air in calcination and combustion, and of the increase of weight which metals gain by oxidation. He studied the chemical phenomena of the atmosphere, and was thus a predecessor of Mayow, Hales, Cavendish and Priestley. In all his philosophical inquiries he displayed an accurate and methodical mind, relying wholly upon experiments. While endeavoring to settle his faith, he found those defenses of the Christian religion which had been published before his time unsatisfactory. In order, therefore, to read the original works which are considered the foundation of Christianity he studied the Oriental languages and formed connections with Pococke, Thomas Hyde, Samuel Clark, Thomas Barlow, etc. The result of his studies was a conviction of its truth, which was manifested not only by his theological writings, but by his benevolence and generous disinterestedness. He instituted public lectures for the defense of Christianity, devoting an annual sum to the payment of a lecturer. Boyle did much for the support of the mission in India and caused Irish and Gaelic translations of the Bible to be made and printed at his own expense. To his religious principles were united the purest morals, a rare modesty and an active benevolence. Three successive kings of England conversed familiarly with him, and no stranger of note visited England without seeking an interview. He was interred in Westminster Abbey. Birch published his life and an edition of his works, five volumes, folio, London 1744; 2d ed., 6 vols., 1772. Latin editions of his works were issued at Geneva in 1677, 1680 and 1714; at Cologne in 1680–96; at Venice 1695, and in French at Paris in 1679.

BOYLE, Roger (BARON BROGHILL and 1st EARL OF ORRERY), English statesman, soldier and dramatist, third son of the 1st Earl of Cork: b. Waterford, 25 April 1621; d. 16 Oct. 1679. When only seven years old he was created Baron Broghill, by which title he is usually known. He commanded a troop of cavalry raised by his father, was employed in the defense of the castle of Lismore and displayed his courage and ability on many occasions in the service of Charles I, on the cessation of whose authority he acted under the Parliamentary commissioners in Ireland. When the King was put to death, he retired for a while from public life, but being courted by Cromwell, he accepted a commission from him and assisted him materially in reducing the Irish to subjection. He served his new master with zeal and fidelity, and few persons were more trusted or distinguished by him. Oliver, becoming Protector, made Lord Broghill one of his privy council and a member of his House of Lords. In 1656 he sent him to Scotland, with a commission to govern there with absolute authority for one year, and his conduct was such as proved satisfactory both to the Scots and the Protector. On the death of Cromwell, becoming aware of the approaching restoration of regal power, he exerted himself with such dexterity and success in promoting it as to obtain much credit for his conduct. Charles II rewarded him with the title of Earl of Orrery and he was appointed one of the lords justices for Ireland. Among his dramatic writings are 'Henry V,' 'Mustapha, the Son of Solyman the Magnificent,' 'Tryphon.' His comedies include 'Guzman' and 'Mr. Anthony.' He also wrote several poems, one of them being on the death of his friend, Abraham Cowley.

BOYLE, Virginia Frazer, American poet and novelist: b. near Chattanooga, Tenn.; daughter of the late Charles Wesley Frazer, a prominent lawyer and Confederate officer; educated Higbee School; married Thomas R. Boyle, lawyer, of Memphis. Holds office of poet laureate of United Confederate Veterans' Association, created for her by change in constitution, which forbade a woman holding office, 1910. Member Colonial Dames, Daughters of American Revolution, United Daughters of Confederacy, Ladies' Confederate Memorial Association and organizer of the Junior Confederate Memorial Drum and Fife Corps. Author 'The Other Side' (1893); 'Brokenburne' (1897); 'Devil Tales' (1900); 'Serena' (1905); 'Love Songs and Bugle Calls' (1906). Wrote a series of negro folk-tales for *Harper's Magazine* and a series of negro plantation tales for the *Century Magazine;* has contributed prose and verse articles to various magazines. Wrote prize centennial ode, Tennessee 1896; Jefferson Davis Centennial ode for U. C. V. Association 1908; Abraham Lincoln ode for the centenary celebration of the Philadelphia Brigade Association 1909; Robert Edward Lee — The South's Gift to Fame, U. C. V. Association; Dream of the Alabama, centennial of Admiral Semmes, C.S.N., for the Confederated Memorial Associations 1909; commemoration ode for the 125th anniversary inauguration of Washington, for G. A. R. of Pennsylvania, 1914.

BOYLE, Ireland (Ir. *Manistir na Buille,* monastery of the Boyle), town in county Roscommon, on the river Boyle, one mile northeast of Loch Gara and the same distance west of Loch Key, on the Midland Great Western Railway. It has a large trade in grain, butter and poultry products. It is a favorite angling centre. Boyle was a noted monastic centre from the 5th to the 15th centuries. The ruins of a Cistercian abbey, dating from 1161, are well preserved and are of considerable architectural interest. 'The Annals of Boyle,' in Latin and English (420–1245), have been published. Pop. 2,691.

BOYLE LECTURES, a series of discourses so named from the founder, Robert Boyle (q.v.), who left a bequest amounting to $250 annually for this purpose, the theme of the lectures to be Christian apologetics. The first series was given in 1692 by Richard Bentley. The lectures of this course are given annually in a series of eight at the church of Saint-Mary-le-Bow, London.

BOYLE'S FUMING LIQUOR, so called from having been invented by Robert Boyle (q.v.), a fetid, yellow liquid, obtained by distilling sal ammoniac with sulphur and lime. It is sometimes used in medicine under the name of *liquor fumans boylii.*

BOYLE'S LAW. See GAS ILLUMINATION.

BOYLSTON, Zabdiel, American physician: b. Brookline, Mass., 1680; d. Boston, 1 March 1766. He studied medicine, settled in Boston and acquired a prosperous practice. In spite of the almost unanimous opposition of the medical profession and part of the public, he introduced the practice of inoculation for smallpox, having become a firm believer in it. Out of 286 persons inoculated in 1721–22 only six died, and he had the satisfaction of seeing the practice become general in New England long before it became so in England. He visited England in 1725 and was elected a fellow of the Royal Society. Besides some papers published in the ‘Transactions’ of that Society, he wrote ‘Historical Account of the Smallpox Inoculated in New England, Upon All Sorts of Persons, Whites, Blacks, and of all Ages and Constitutions’ (2d ed., 8vo, London 1726; reprinted, Boston 1730).

BOYNE, the chief river of the province of Leinster, Ireland, which rises in the Bog of Allen, county Kildare, and flows northeast through Meath to Drogheda, below which it enters the Irish Sea. Its course is 70 miles in length and it is navigable for barges up to Navan. The Boyne will ever be memorable in English history for the important victory gained on its banks about two miles west of Drogheda, 1 July (new style, 11 July) 1690, by the forces under the command of William III over those of James II. Though James' personal courage was beyond all question, he, on this occasion, allowed the prudence of the sovereign to outweigh the impulses of the soldier. Of his troops 1,500 were killed and wounded, while William lost barely 500 men. In 1736 an obelisk, 150 feet high, was erected at Oldbridge, on the site of the battlefield, in commemoration of this victory. The Orange celebration of the battle takes place on July 12, the date of the battle of Aughrim. See ORANGEMEN.

BOYNE CITY, Mich., city of Charlevoix County, at the mouth of Boyne River, at the head of Pine Lake and on the Boyne City, Gaylor and Alpena Railroad, 180 miles north of Grand Rapids. Its fine natural harbor permits of a thriving transit trade in lumber, fruit and the products of its factories, leather, barrels, handles, chemicals, extracts, clay products, veneer and flavoring. It also has foundries, railroad repair shops and municipally-owned waterworks. Pop. 4,284.

BOYNTON, Henry Walcott, American literary critic and author: b. Guilford, Conn., 22 April 1869. A graduate of Amherst College in 1891, for several years he was head of the English department at Phillips-Andover Academy. From 1901 he did excellent book review work for the *Atlantic Monthly* and the New York *Times*, edited several secondary school textbooks and an edition of Poe's ‘Poetical Works.’ Since 1912 he has been attached to the staff of the New York *Evening Post and Nation*. His published works include short biographies of ‘Washington Irving’ (1901); ‘Bret Harte’ (1903); ‘A Reader's History of American Literature,’ with T. W. Higginson (1903); ‘Journalism and Literature and Other Essays’ (1904); ‘The World's Leading Poets’ (1911); ‘Griselda,’ a comedy (1908); and with Margaret Deland, ‘Dr. Lavendar,’ a play (1913).

BOYS' CLUBS, organizations in which boys constitute the membership. Among clubs formed by boys on their own initiation, those for games and athletics seem to predominate very largely. Clubs for hunting, fighting, etc., are also popular. Sometimes the organizations have a distinctly literary or musical character and sometimes they are chiefly social in their nature. Numbers of clubs are formed for industrial purposes, but judging from statistics, secret societies do not meet with as great a degree of favor as would naturally be supposed. These societies for boys are organized by adults; the aims are in general to keep boys from bad surroundings and stimulate them to nobler ideals of life, to refine their taste and encourage them in habits of thrift, industry and study. Such clubs also try to foster a habit of reading good books. Clubs in large cities sometimes have hundreds of members and provide fine buildings, in which opportunity is offered for a variety of activities ranging from manual training and other forms of instruction to social entertainment. The religious interests of the boys are also cared for in various ways. The clubs connected with social settlements are often small, thus affording a better opportunity for reaching the boys personally, an end difficult of achievement in societies with large membership. About 200,000 boys in America and 25,000 in England are members of such clubs. See Forbush, ‘How to Keep Boys’ (1900); Forbush, ‘The Boy Problem’ (1901); Newman, ‘The Boys' Club in Theory and Practice’ (1900); Buck, ‘Boys' Self-Governing Clubs’ (1903); Russell and Rigby, ‘Working Lads' Clubs’ (1908); Forbush, ‘The Coming Generation’ (1912); McKeever, W., ‘Training the Boy’ (New York 1914).

BOZ, bōz, a pseudonym used by Charles Dickens in the publication of ‘Sketches by Boz,’ which appeared in book form in 1836. That the pronunciation of this name now in vogue is not correct is shown by Dickens' explanation of its origin. A younger brother of the author had in childhood received from the latter the nickname Moses, “which being facetiously pronounced through the nose became Bōses, and being shortened became Bōz.”

BOZEMAN, bōz'măn, Mont., city and county-seat of Gallatin County, on the Northern Pacific Railroad, in the midst of a region of valuable ores, such as gold, silver, coal and iron. Its industries are breweries, flour and lumber mills, brickyards, stone quarries and the like, and it contains the State College of Agriculture and Mechanic Arts, opened in 1893, a public library and county and municipal buildings. A canal of about 20 miles in length has been constructed both for irrigation and as a waterway. Pop. 6,000.

BOZEN. See BOTZEN.

BOZMAN, John Leeds, American historian and jurist: b. Talbot County, Md., 25 Aug. 1757; d. there, 23 April 1823. He studied law and practised in his native state. He wrote a ‘Historical and Philosophical Sketch of the Prime Causes of the Revolutionary War,’ in which he praised Washington, and condemned Franklin; but it was suppressed. During the administrations of Washington and the elder Adams, he wrote much in the journals of the day, and at a later period in Dennie's ‹Portfolio.› His literary reputation rests chiefly on his ‹History of Maryland, from the Earliest Settlement in 1633, to the Restoration in 1660,› a posthumous work, published in 1836.

BOZRAH, bŏz'ra, Heb. «a fortification,» the name of several places in Biblical history: Bozrah of Edom, a city of great antiquity; El-Buseireh, seven miles southwest of the ancient Tophel, on the main road north from Petra, is probably the modern site. Bozrah in Moab is identified by some scholars with Bezer, but the great city Bozrah esh-Shâm in Haurân is advocated by others. There is considerable conflict of opinion as to the exact locations. The Bozrah, east of the Jordan, about 80 miles south of Damascus, was the capital of Og, King of Bashan, and subsequently belonged to the tribe of Manasseh. Early in the Christian era it became a flourishing place and was long a great emporium of trade. It is now a scene of ruins.

BOZZARIS, bō'tsạ-rẹs, **Marcos,** a hero of the Greek war of independence against the Turks: b. Suli, in Epirus, about 1790; d. Missolonghi 1823. He was descended from a Suliote family renowned for its bravery, and after the fall of Suli retired to the Ionian Islands, from whence he made a vain attempt to deliver his native country. He then entered an Albanian regiment in the French service and in 1813 became a member of the Hetæria, a society formed for national regeneration. In 1820, when the Turks were carrying on war against Ali Pasha, the latter sought aid from the exiled Suliotes and Marcos Bozzaris returned to Epirus. On the outbreak of the war of independence he at once joined the Greek cause and distinguished himself as much by his patriotism and disinterestedness as by his military skill and personal bravery. In 1822 he took part in the war which was going on in western Greece and acquired special renown by his defense of Missolonghi. In the summer of 1823, when he held the command-in-chief of the Greek forces in that port, he was dangerously wounded at a night attack on the camp of the Pasha of Scutari, near Karpenisi, and died soon after. His deeds are still celebrated by the Greeks in many popular songs. Through Halleck's spirited poem, ‹Marco Bozzaris,› his name and fame have been made familiar to several generations of American schoolboys.

BRABANÇONNE, brạ-bäñ-sŭn, the national song of the Belgians during the revolution of 1830, composed by Jenneval, at that time an actor at the theatre of Brussels, and set to music by Campenhout. Each verse of the song ends with the refrain:

"La mitraille a brisé l'orange
Sur l'arbre be la liberté"

BRABANÇONS, brạ-bäñ-sôñ, a class of adventurers and lawless soldiers in the Middle Ages, ready to fight for pay on either side and in any quarter. They derive their name from Brabant, the chief nursery of these troops, and were particularly notorious in France in the 12th century.

BRABANT, Belgium, a province bounded by Amsterdam on the north, Liège and Limburg on the east, East Flanders on the west, Hainaut and Namur on the south. It has an area of 1,268 square miles and includes the cities of Brussels, Louvain, Aerschot, Tirlemont, Nivelles and Wavre. The Dyle, Dewer and Senne are the principal streams. The soil is level and is well cultivated. Pop. 1,469,677. The province suffered greatly in the autumn of 1914, when the German armies invaded Belgium in order to strike swiftly at France. Louvain was burned, its library being an irreparable loss. The province was entirely occupied by the invading forces, placed under martial law, and its civil affairs, as in the case of the other occupied provinces, administered by a governor-general, resident at Brussels. For history see BRABANT, DUCHY OF.

BRABANT, Duchy of, brä'bănt, or brạ-bänt', the central district of the lowlands of Holland and Belgium, extending over an area of 4,341 square miles, from the left bank of the Waal to the sources of the Dyle and from the Meuse and the plains of Limburg to the lower Scheldt. In the Middle Ages it formed a separate independent duchy, called Lower Lorraine. It is divided at present between the kingdoms of Holland and Belgium, into three provinces: (1) Dutch or North Brabant, with an area of 1,980 square miles; (2) the Belgian province of Antwerp, with an area of 1,093 square miles; (3) the Belgian province of South Brabant, with an area of 1,268 square miles. The country is comprehended in a plain, gently sloping to the northwest, occupied in the north by heathy and marshy tracts and in the south passing into the gentle rising ground which forms the first ascent of the forest of Ardennes. It is copiously watered by the Meuse in the north and the Scheldt in the south, in the former of which the internal transit is furthered by means of canals, among others the South William and the Breda canals, and in the latter by railways which have their point of union at Mechlin. Under the influence of a northerly, indeed, and moist but in general healthful and mild climate, the great fertility of the soil renders agriculture and the raising of cattle the principal and most profitable employment of the inhabitants. With this is associated the general diffusion of an active industry which supports an extensive trade, consisting chiefly of lace, cotton, woolen and leather goods.

Through Cæsar's campaigns the Romans became acquainted with the inhabitants of Brabant as a mixed race of Germans and Celts. The Menapians, particularly, inhabiting the country between the Rhine, the Meuse and the Scheldt, made, as the most powerful and warlike among the various tribes, a gallant though ultimately ineffectual resistance to the Roman arms, by whose conquests this portion of lower Germany was incorporated with the province of Gallia Belgica. In the 5th century the Franks gained possession of Brabant, which in the 6th was, at the partition of the Frank kingdom, assigned to the primitive country of Austrasia; in the 9th century it was united to Lorraine, and on the division of the latter, in 870, became the property of France, from which, however, in the commencement of the 10th century, it was transferred by Henry I again to Lorraine; in 959 to Lower Lorraine and thus to Germany.

In the beginning of the 11th century it was separated from Lorraine, on Duke Otho, the son of Charles the Fat, who had been invested by the Emperor Otho with Lower Lorraine, dying childless in 1005. After this, several counts of Ardennes and Godfrey of Bouillon possessed it till 1076; the Emperor Henry V mortgaged it to Godfrey the Bearded, of the family of the counts of Louvain and Brussels, whose house reigned over Brabant to the middle of the 14th century. As early as 1190 we find the title of Duke of Brabant, in which the former title of Duke of Lower Lorraine or Lothier was gradually absorbed. Under the government of its own dukes Brabant gained rapidly in power and independence, but was engaged in numerous contests with its neighbors and shifted much in its leanings between Germany and France. Of the six dukes of Brabant, Henry I, II and III and John I, II and III, there are more especially to be mentioned John I, who, by the celebrated battle of Wöringen (1288), united Limburg to Brabant, and is also renowned in Germany as a minnesinger or troubadour, and John III, who, in 1349, received from the Emperor Charles IV the important privilege of a free judicature, under the name of the Brabantine Golden Bull, in consequence of which his subjects ceased to be amenable to any foreign jurisdiction. With John III, the male heirs of the family of the counts of Louvain became extinct in 1355, and, by the bequest of his daughter Joanna, who reigned till 1406 and married Wenceslaus of Luxemburg, Brabant came into the possession of the house of Burgundy and in the first instance to Antony of Burgundy, Joanna's grand-nephew and second son of Philip the Bold. On Antony's death at the battle of Agincourt, in 1415, and his two successors, his son, John IV, and his brother Philip, Count of Saint Pol, dying childless respectively in 1427 and 1430, Brabant, as the inheritance of Philip the Good, became formally incorporated with the dominions of the house of Burgundy. In this state, however, it did not long continue, and, by the marriage of Mary of Burgundy with the Emperor Maximilian, was transferred to the house of Austria and subsequently to the Emperor Charles V, who abdicated in favor of his son, Philip II of Spain. The persecuting edict of the latter, and the Duke of Alva's cruelties, excited a revolt in Brabant, but it was only the northern portion (Hertogenbosch) which succeeded in asserting its independence, and in 1648 was incorporated with the United Provinces under the name of the Generality Territory, while South Brabant remained till 1714 in the possession of the Spaniards. On the extinction of the Spanish-Austrian line in the latter year, Brabant, with the other southern provinces of the Netherlands, reverted to the imperial house of Austria, which, however, was unable long to retain it in peace. On a violent contest breaking out under the Emperor Joseph II, as to the explanation of the provincial privileges which Brabant possessed under the Joyeuse Entrée (q.v.), and the consequent dismissal of the assembly of the states of Brabant and Limburg, the Brabantines assembled of their own authority, and boldly pronounced the separation of Brabant from the supremacy of the house of Austria. Leopold II settled the dispute after Joseph's death by granting their ancient privileges to the people of Brabant. At the close of the Napoleonic wars the whole of Brabant was included in the Kingdom of the Netherlands, and was divided into three provinces. After the revolution of 1830 the provinces of Antwerp and South Brabant became parts of Belgium. The eldest son of the King of the Belgians bears the title of Duke of Brabant. Consult Omond, ‘Brabant and East Flanders’ (1907). See BELGIUM.

BRACCIO (brä'chō) **DA MONTO'NE, Andrea,** Italian captain: b. Perugia of the illustrious family of the Fortebracci 1368; d. 1424. He early embraced the profession of arms, and entered the service of Ladislas, King of Naples, under the promise that he, if successful, would make him master of Perugia; but when the Perugians, determined to keep out Braccio, offered to open their gates to Ladislas, if he would retain it for himself, he broke faith with Braccio, and accepted their terms. Braccio next served under Florence, afterward attaching himself to Pope John XXIII, who, on repairing to the Council of Constance, where he was deposed, entrusted Braccio with the defense of Bologna. Ladislas being now dead, and the church without a head, Braccio saw that the moment for which he had waited had arrived; and allowing the Bolognese to redeem their liberty by a money payment, suddenly, in 1416, pounced on Perugia. The Perugians vainly endeavored to resist, and saw themselves compelled to receive Braccio as their lord. His rule, though firm and occasionally severe, was milder than might have been anticipated; and he soon showed that his wisdom as a statesman was not less than his ability as a captain. Though Braccio had now gained the great object of his life, ambition led him to attempt the conquest of Rome, and he gained several advantages over Sforza, who had long been his rival. Ultimately, however, the new Pope, Martin V, proved more than a match for him. A truce was patched up between them and soon after Braccio became High Constable of Naples. He took Capua, of which he was made prince in 1421. Three years later he invaded Campania and Apulia, took Bari and laid siege to Aquila, but was here made prisoner and severely wounded. He took the disgrace seriously and would neither take food nor allow his wounds to be examined. Consult Spirito, Lorenzo ‘L'altro Marte’ (Vicenza 1489).

BRACCIOLINI, brä-chō-lē'nē, **Poggio Giovanni Francesco,** Italian classical scholar: b. Terra Nuova, near Arezzo, 11 Feb. 1380; d. Florence, 30 Oct. 1459. In 1416 he undertook the laborious task of searching the ancient monasteries for manuscripts, and succeeded in recovering seven orations of Cicero, and a great number of other classical writings. Having impoverished himself in these researches, he accepted an invitation of Cardinal Beaufort to go to England, but, disappointed in his hopes of preferment, and in the literary atmosphere of the country, returned to Italy in 1421, and became apostolic secretary to Martin V and to several succeeding popes, having served not less than eight popes in the same capacity. On the appearance of the plague at Rome in 1450, he withdrew to Florence, where he was chosen chancellor three years afterward. His ‹History of Florence› (translated by his son Jacopo, from Latin into Italian) comprises the period from 1350 to 1455. Among his most finished productions is his ‹Dialogue on Nobility.› His writings are on moral, philosophical and controversial subjects, and comprise many translations, orations and letters, the latter deriving peculiar interest from their reference to contemporary life. His works have not yet been properly collected, the Basel edition of 1538 being considered imperfect. His biography, by Rev. William Shepherd (1802), was translated into Italian, German and French.

BRACE, Charles Loring, American author and philanthropist: b. Litchfield, Conn., 19 June 1826; d. Campier, Switzerland, 11 Aug. 1890. He was graduated at Yale in 1846, and studied theology, but held no pastorate. In 1850 he made a tour through Great Britain and later through Hungary. Afterward, he studied the school systems of Switzerland, England and other countries. He devoted himself to philanthropy in New York, where he became secretary to the New York Children's Aid Society, and lectured, wrote and worked to enlist aid for the children of the poor. His books include ‹Hungary in 1851› (New York 1852); ‹Home Life in Germany› (1853); ‹The Norse Folk› (1857); ‹Short Sermons to Newsboys› (1861); ‹The Dangerous Classes of New York and Twenty Years' Work Among Them› (1872, 3d ed., 1880); ‹Free Trade as Promoting Peace and Good Will Among Men› (1879); ‹Gesta Christi› (1883), a review of the achievements of Christianity from the earliest days in bettering the moral and social condition of the world; and ‹To the Unknown God› (1889). Consult his life, edited by his daughter (New York 1894).

BRACEBRIDGE, Canada, in the Muskoka district, Ontario, six miles from the famous Muskoka Lakes, on the Grand Trunk and Grand Trunk Pacific railways, 120 miles north of Toronto. It has woolen and linen mills, tanneries, saw mills and planing mills, sash factory, boat-works, brickworks, etc. Pop. 2,776.

BRACEBRIDGE HALL, a series of studies of English life by Washington Irving, published in 1822 with the pseudonym ‹Geoffrey Crayon, Gent.›

BRACELET, an ornament usually worn on the wrist, the use of which extends from the most ancient times down to the present, and belongs to all countries, civilized as well as uncivilized. The word has come to us from the French and is ultimately derived from *brachium*, the Latin word for the arm. Bracelets were in use in Egypt at a very remote period. They were of different colors, painted on them in enamel in very bright as well as very delicate shades. They were also then as now frequently made of gold, enchased with various kinds of precious stones. They were not always worn, as with us, on the wrist, but frequently on the upper part of the arm. The ancient Medes and Persians were well known to be extremely fond of this method of adorning themselves; and in the Bible the bracelet is frequently mentioned as an ornament in use among the Jews, both men and women. Among the ancient Greeks, in historical times, bracelets do not appear to have been worn by the men; but, on the other hand, they were worn by the Greek ladies, made of every variety of material, and in every possible form. A preference was generally given to the spiral form, and a bracelet of this kind is described by Homer in the Iliad. Very frequently the spiral bracelets were made to assume the appearance of snakes, which went round the arm twice or thrice, or even a greater number of times. Among the ancient Italian tribes bracelets were also an ornament of the men. The Sabines often wore very heavy ones on the left arm. Among the Romans it was a frequent practice for a general to bestow bracelets on soldiers who had distinguished themselves by their valor. Roman ladies of high rank frequently wore them both on the wrist and on the upper arm. The Arabs and the Orientals generally use them, chiefly as an ornament for women. Among the ancient heathen Germanic tribes they formed the chief and almost only ornament, as is shown by their being so often found in old graves. The men seem to have used them even more than the women, for bracelets have been found in dozens on the arms of the former. The spiral was the favorite form with the ancient Germans as with the ancient Greeks.

BRACHET, brȧ'shā, **Auguste**, French philologist and journalist: b. Tours 1845; d. 1898. A pupil of Diez and Littré, he became professor of Romance philology at the Ecole des Hautes Etudes, Paris, in 1870, and was examiner of German in the Ecole Polytechnique, 1872–74. His best-known work, the first of its kind, is ‹Grammaire historique de la langue française› (1867; English translation by Kitchin, Oxford 1869), which was adopted as a text by the principal English and American universities and of which over 30 editions have appeared. He also published ‹Dictionnaire etymologique de la langue française› (Paris 1870), and with Gaston Paris and Morel-Fatio translated into French Diez's ‹Grammaire des langues romanes› (1873–76). His controversy with the Italian Premier Crispi and Ambassador Nigra is historically significant. In ‹L'Italie qu'on voit et l'Italie qu'on ne voit pas› (1887) Brachet contended that the Italian youth was being educated antagonistic to France in favor of Germany which was strenuously denied.

BRACHIAL (brā'kĭ-ăl) **ARTERY.** See Arteries.

BRACHIAL PLEXUS. See Nerves.

BRACHIOPODS, or **BRACHIOPODA**, the class of shelled worms, formerly placed among mollusks. The class is named *Brachiopoda* from the feet-like arms, fringed with tentacles, coiled up within the shell, and which correspond to the lophophore of the Polyzoa and the crown of tentacles of the Sabella-like worms. The shell, which lives attached to rocks, is in shape somewhat like an ancient Roman lamp, the ventral and larger valve, being perforated at the base for the passage through it of a peduncle by which the animal is attached to rocks. The shell is secreted by the skin (ectoderm), and is composed of carbonate (Terebratulina) or (Lingula) largely of phosphate of lime.

The body of Brachiopods is divided into

two parts, the anterior or thoracic, comprising the main body-cavity in which the arms and viscera are contained, and the caudal portion, that is, the peduncle. The part of the body in which the viscera lodge is rather small in proportion to the entire animal, the interior of the shell being lined with two broad lobes, the free edges of which are thickened and bear setæ, as seen distinctly in Lingula. The body-cavity is closed anteriorly by a membrane which separates it from the space in which the arms are coiled up. The pallial chamber is situated between the two lobes of the mantle (*pallium*) and in front of the membrane forming the anterior wall of the body-cavity. In the middle of this pallial chamber the mouth opens, bounded on each side by the base of the arms. The latter arise from a cartilaginous base, and bear ciliated tentacles, much as in the worm Sabella. In Lingula, Discina and Rhynchonella, they are developed, in a closely wound spiral, as in the genuine worms (Amphitrite). In Lingula the arms can be partially unwound, while in Rhynchonella they cannot only be unwound but protruded from the pallial chamber. In many recent and fossil forms the arms are supported by loop-like solid processes of the dorsal valve of the shell, but when these processes are present the arms cannot be protruded beyond the shell. The tentacles or cirri on the arms are used to convey to the mouth particles of food, and they also are respiratory in function, there being a rapid circulation of blood in each tentacle, which is hollow, communicating with the blood-sinus or hollow in each arm, the sinus ending in a sac on each side of the mouth.

The digestive system consists of a mouth, œsophagus, stomach, with a liver-mass on each side, and an intestine. The mouth is bordered by two membranous, highly sensitive and movable lips. The stomach is a simple dilatation of the alimentary canal, into which empty the short ducts of the liver, which is composed of masses of cæca. The liver originally arises as two diverticula or offshoots of the stomach. The short intestine ends in a blind sac or in a vent, and is, with the stomach, freely suspended in the perivisceral cavity by delicate membranes springing from the walls of the body.

The nervous system consists of two small ganglia above, and an infraœsophageal pair of larger ganglia, and there are two elongated ganglia behind the arms, from which nerves are given off to the dorsal or anterior lobe of the mantle.

The larva is top-shaped (trochosphere) and is quite active, swimming rapidly about in every direction.

While in their development the *Brachiopoda* recall the larvæ of the true worms, they resemble the adult worms in the general arrangement of the arms and viscera, though they lack the highly developed nervous system of the Annelids, as well as a vascular system, while the body is not jointed. On the other hand they are closely related to the Polyzoa, and it seems probable that the Brachiopods and Polyzoa were derived from common low vermian ancestors, while the true Annelids probably sprang independently from a higher ancestry. They are also a generalized type, having some molluscan features, such as a solid shell, though having nothing homologous with the foot, the shell gland or odontophore of mollusks.

In accordance with the fact that the Brachiopods are a generalized type of worms, the species have a high antiquity, and the type is remarkably persistent. The Lingula of our shores (*Glottidia pyramidata*) lives buried in the sand, where it forms tubes of sand around the peduncle, just below low-water mark from Chesapeake Bay to Florida. It has remarkable vitality, not only withstanding the changes of temperature and exposure to death from various other causes, but will bear transportation to other countries in sea-water that has been unchanged. Living lingulæ have been carried from Japan to Boston, Mass., the water in the small glass jar containing the specimens having been changed but twice in four months. The living species of this cosmopolitan genus differ but slightly from those occurring in the lowest fossiliferous strata. Between 80 and 90 living species are known, most of them living, except Lingula, which is tropical, in the temperate or Arctic seas, while nearly 2,000 fossil species are known. The type attained its maximum in the Silurian Age, and in Palæozoic times a few species, as *Atrypa reticularis,* extended through an entire system of rocks and inhabited the seas of both hemispheres. Consult Zittel-Eastman, ‘Textbook of Palæontology’ (New York 1900).

BRACHT, bräʜt, **Felix Prosper Eugen,** German artist: b. Morges, Switzerland, 1842. He is best known as a landscape artist. He studied at Karlsruhe and Düsseldorf under H. Gude, and in 1882 was appointed a professor in the Berlin Academy and professor at the Dresden Academy in 1901. His early work consisted of landscapes of the Lüneburg Heath and the Baltic shore, which brought him into general notice. His well known works are ‘Stormy Evening on Rügen’; ‘Giants’ Grave in Hümling’; ‘Mount Sinai’; ‘The Brook Kidron,’ and ‘Nightfall on the Dead Sea,’ the last named his greatest work. Other important works are ‘The Tomb of Cecil Rhodes’; Hannibal’s Grave’ and ‘Three Towers of Gauerthal.’ Consult Osborn, ‘Eugen Bracht’ (1909).

BRACHVOGEL, braʜ'fō-gël, **Albert Emil,** German novelist and dramatist: b. Breslau 1824; d. 1878. He at first studied engraving and modeling, but abandoned these for the drama and fiction fields; wrote several dramas and a large number of works of historical fiction. He is best known by his drama, ‘Narcisse’ (1857), which attained many editions and was translated into various European tongues. ‘Beaumarchais’ (1865); ‘Benoni’ (1860); and ‘Glancarty’ (1872); ‘Der deutsche Michael’ (1868). Consult Mittelmann, ‘Albert Emil Brachvogel und seine Dramen’ (1910).

BRACHYDACTYLY, a condition of abnormal breadth of palm and shortness and thickness in the fingers resulting from a diseased condition, during growth, of the pituitary body, a gland situated beneath the brain. It may be hereditary or may be acquired, when it is symptomatic of excessive secretions of this gland. Consult Osborn, ‘Origin and Evolution of Life’ (New York 1917). *Dolichodactyly* is the opposite condition of abnormally prolonged hands and fingers, owing to insufficient secretions of the pituitary gland.

BRACHYLOGUS, bra-kil'o-gus, a 12th century compilation of unknown authorship, containing a systematic exposition of the later Roman law, based principally on the *Institutes of Justinian,* although largely drawn from the *Digest* and other parts of the *Corpus Juris.* The earliest existing edition was published in 1549 at Lyons.

BRACKENBURY, Sir **Henry,** English soldier: b. Bolingbroke, Lincolnshire, 1 Sept. 1837; d. 20 April 1914. He entered the Royal Artillery in 1856, supervised aid to the wounded during the Franco-Prussian War in 1870, served in the central Indian, Ashanti and Zulu campaigns and the Nile campaign of 1884–85; and was made lieutenant-general in 1888, and director-general of ordnance at the War Office, 1899–1904. He was the author of 'Fanti and Ashanti' (1873); 'Narrative of the Ashanti War' (1874); 'The River Column' (1885).

BRACKENRIDGE, Henry Marie, American author and lawyer: b. Pittsburgh, Pa., 11 May 1786; d. there, 18 Jan. 1871. He was educated by his father, H. H. Brackenridge (q.v.) and admitted to the bar 1806. In 1811 he descended the Mississippi River in a «keelboat» to New Orleans, and was soon appointed deputy attorney-general for the then territory of Orleans, becoming district judge in 1812. In 1817 he was secretary to the commission sent to the South American republics, and in 1821 was appointed United States judge for the western district of Florida, holding it until he removed to Pittsburgh in 1832. In 1841 he was commissioner under the treaty of Mexico. His knowledge of the French and Spanish languages and laws made him of considerable service to the government in all affairs connected with the Louisiana and Florida purchases. He wrote 'Views of Louisiana in 1810' (1812); 'Letter to Mr. Monroe by an American'; 'Voyage to South America in 1817–18' (1818); 'History of the Late War [1812] between the United States and Great Britain'; 'Recollections of Persons and Places in the West' (1834); 'Essays on Trusts and Trustees' (1842); 'History of the Western Insurrection' (1859), a vindication of his father's share in that affair.

BRACKENRIDGE, Hugh Henry, American jurist: b. near Campbelton, Scotland, 1748; d. Carlisle, Pa., 25 June 1816. He came with his father to the United States at the age of five, and was graduated from Princeton in 1771. For five years he taught at Princeton and in Maryland, writing for his pupils a drama 'Bunker Hill,' published in 1776, in which year he went to Philadelphia as editor of the newly founded *United States Magazine.* During the American Revolution he was a chaplain in the army. After being admitted to the bar he removed to Pittsburgh, became prominent in his profession, and during the «Whisky Insurrection» (1794) was influential in bringing about a settlement between the government and the malcontents. In 1799 he was appointed to the supreme bench of Pennsylvania. A man of literary tastes, he wrote a number of pieces much thought of in their day. At his graduation he wrote (with Philip Freneau) a poetical dialogue 'The Rising Glory of America.' Other works by him are 'Incidents of the Insurrection in Western Pennsylvania' (1795); 'Law Miscellanies' (1814); 'Modern Chivalry, or the Adventures of Captain Farrago and Teague O'Regan, His Servant,' a political satire and his best work (1st pt. 1796; 2d, 1806). Consult Trent, 'American Literature' (New York 1903).

BRACKENRIDGE, Pa., borough of Allegheny County, 25 miles from Pittsburgh, on the Allegheny River, and on the Pennsylvania Railroad. It contains glass factories and steel mills and has plentiful deposits of coal, oil and natural gas. Pop. 3,421.

BRACKETT, Anna Callender, American educator: b. Boston, 21 May 1836; d. 1911. She taught in various normal schools, being the first woman principal of such an institution, and was principal of a private school for girls in New York for 20 years. This was the first girls' school in New York State requiring Latin for all students and placing German in the regular curriculum. She published 'Education of American Girls' (1874); 'Philosophy of Education,' from the German (1886); 'Technique of Rest' (1892); 'Woman and the Higher Education' (1893).

BRACKETT, Frank Parkhurst, American mathematician: b. Provincetown, Mass., 16 June 1865. He graduated at Dartmouth College in 1887, and since 1890 has been professor of mathematics and astronomy at Pomona College, Claremont, Cal. He has written several important mathematical and meteorological papers. He was a member rof the Smithsonian Astronomical Expedition to Africa 1911, and to Mount Whitney 1913.

BRACKETT, John Quincy Adams, American lawyer: b. Bradford, N. H., 8 June 1842; d. Arlington, Mass., 6 April 1918. He was graduated at Harvard College in 1865, being orator of his class: was graduated at the Harvard Law School in 1868, and was engaged in the practice of law in Boston for many years. Was a member of the Boston common council 1873–76, inclusive, being its president in 1876. Was a member of the Massachusetts legislature 1877–82 and 1884–87, being speaker of the house 1885–87. Was lieutenant-governor 1887–90 and governor of Massachusetts 1890–91. Was one of the delegates-at-large from Massachusetts to the Republican National Convention in 1892 and in the convention was the member of Massachusetts of the committee on platform. Was first presidential elector-at-large for Massachusetts in 1896 and chairman of the meeting of the Massachusetts electors then chosen. Was again presidential elector-at-large in 1900.

BRACQ, Jean Charlemagne, American college professor and author: b. Cambrai, France, 3 May 1853. He came to the United States in 1871, graduated in 1881 from McGill University, Montreal, and completed his studies at the Newton Theological Institution, in Edinburgh, and in Paris. From 1885 to 1891 he was secretary of the American McAll Association, Philadelphia, and then joined the Vassar faculty as associate professor and in 1892 as professor of Romance languages. He edited the *Huguenot Quarterly* from 1896 to 1903 and wrote extensively on French questions and international relations, his ‘French Rights in Newfoundland,’ read before the Academy of Moral and Political Sciences in Paris forming the basis of settlement of the long-standing international dispute. He is also the author of ‘France under the Republic’ (1910).

BRACQUEMOND, bra̦k-môn, **Joseph Felix Auguste,** French artist and engraver: b. Paris 1833. He was a pupil of Guichard. He first exhibited in the Salon of 1852 and his etchings and reproductions of noted masters speedily brought him into notice. His portrait work and studies of animal life also brought him a large measure of fame. His portraits are especially prized and as an etcher he is represented by over 800 plates. He introduced a new method of decoration about 1867 and five years later became connected with the painting department of the Sevres porcelain factory. Later he removed to the suburbs of Paris where in his ceramic studio he did much work for a Limoges porcelain house.

BRACT, a much reduced leaf, especially from the axil of which a flower or flower-stalk develops, and thus distinguished from the ordinary leaf, from the axil of which a leaf-bud usually proceeds. Bracts may thus be entirely similar to the ordinary leaves of a plant, in which case they are called leafy bracts; but very commonly they are somewhat changed in form, and although they may be sometimes divided, they are for the most part entire even when the ordinary leaves are divided. In some cases they are so much changed in form as to be mere scales or threads, and sometimes they are not developed at all, in which case the inflorescence is said to be ebracteate. When the flowers of a plant are sessile, the bracts are often applied closely to the calyx, and are thus apt to be confounded with it; and when the bracts are colored, they are apt to be mistaken for parts of the corolla. When the inflorescence of a plant is branching, subordinate flower-stalks proceeding from one main flower-stalk, bracts are often seen at the base of the former, and these are called bracteoles. A spathe is a kind of large bract.

BRACTON, or **BRATTON, Henry de,** English ecclesiast and judge: d. 1268. Born at Bretton-Clovelly, Devonshire, educated at Oxford where he took the degree of doctor of laws, in 1244 he became one of the traveling circuit judges and 10 years later chief justice of England, an office which he held for 20 years. His fame rests on his ‘De Legibus et Consuetudinibus Angliæ,’ the earliest comprehensive treatise on English law, characterized by Pollock and Maitland as «the crown and flower of English mediæval jurisprudence.»

BRADBURY, John Buckley, English physician and author: b. Saddleworth, Yorkshire, 27 Feb. 1841. He was educated at King’s College, London, and Caius and Downing Colleges, Cambridge. He is Downing professor of medicine at Cambridge University. His works include ‘On Vertigo’ (1870); ‘On Some New Vaso-Dilators,’ etc. (1895); ‘On Some Points connected with Sleep, Sleeplessness and Hypnotics’ (1899).

BRADDOCK, Pa., borough in Allegheny County, on the Monongahela River, and on the Pennsylvania, the Baltimore and Ohio and the Pittsburgh & L. E. railroads, 10 miles above Pittsburgh. There are extensive blast furnaces and manufactories of steel rails, steel wire, pig-iron, cement, plaster, etc. The four banks and two trust companies have a combined capitalization of $1,250,000. Braddock has the first Carnegie Free Library established in America, a daily newspaper, a hospital, numerous churches and public and high schools. The borough was first settled in 1795 on the site of Braddock’s defeat and was incorporated in 1867. The government is vested in a burgess and a council of 12 members elected for three years. The waterworks are owned and operated by the borough. Pop. (1920) 20,879.

BRADDOCK, Edward, British general: b. Perthshire, Scotland, about 1695; d. Great Meadows, Pa., 13 July 1755. Through his father, an officer in the Coldstream Guards, he became in 1710 an ensign in that famous regiment. Appointed captain in 1736, he rose to lieutenant-colonel by service on the Continent 1742–45, including the battle of Fontenoy in 1745, where the Coldstreams covered themselves with glory; and in 1754 was made major-general of the line. In that year an expedition to destroy the French power in America was resolved on; and on 24 September Braddock was made generalissimo of all the forces there. But his experience made him overrate formal discipline, and underrate (not only in action but in expert counsel) both foes and allies who lacked it; he could not fully realize new dangers nor appreciate methods of meeting them; he was hot of temper, rough of speech, overbearing in argument, obstinate in opinion; and these defects, with the martinetism natural enough in an officer of 60 after 43 years of the Coldstreams, and which were not vital in a drilled service, fatally alienated those in the new land on whom he had to depend for safety. Yet he was quick to recognize ability and warm in acknowledging it; he regarded Washington and Franklin, the former but 22, as the greatest men in the colonies; and when the royal order of 1754 ranking colonial commissions below English ones prevented Washington from joining him, he sent a handsome letter asking the latter to be one of his military family, and promised to use his influence in securing him a regular English commission. Landing at Hampton Roads, Va., 20 Feb. 1755, he attempted to collect men and stores for his expedition against Fort Duquesne (Pittsburgh), but was baffled for many weeks by the sloth, rapacity and unpatriotic local factions of the colonists, who did their best to justify the contempt with which he heartily if injudiciously visited them. The lack of men, supplies, transportation and money delayed the expedition to its ruin. He tried to secure a large body of Indians for scouts and allies, but only obtained 40 or 50. He let all but eight of them go through bad judgment, and disgusted those who remained so greatly by his manners that one of them deserted, and the rest warned their friends against coming near. The famous Indian hunter, Captain Jack, wished to join him, but Braddock refused unless he would conform to military discipline, which the old scout would not do. Finally the expedition started from Fort Cumberland (now Cumberland, Md.) the first week in June, with

2,150 men. The march was most toilsome and slow, involving cutting roads, bridging streams, making causeways, passing through swamps, etc.; and on the 18th, at Little Meadows, 1,200 picked men were chosen to continue the expedition, the rest being left behind under Dunbar. On the night of 4 July he halted two days about 25 miles from his destination, to await the reports of his Indian scouts and convoy of provisions from Dunbar's camp — to his destruction but not to his blame. Reaching Turtle (now Rush) Creek the road suddenly ended at a precipice impassable for artillery and wagons, and he decided to quit the ridge, where ambuscade was impossible, and make a double fording across an elbow of the Monongahela. Meantime the French commander, Contrecœur, had decided to withdraw without a blow, but a Captain Beaujeu asked leave to take a detachment and resist the passage of the second ford, eight miles off. He was given about 200 white troops, and by a brilliant appeal on the morning of the 9th to the Indians, who at first hung back, obtained several hundred of them also. When he came in sight of the English, they had already crossed and advanced so that both their flanks were exposed for some 200 yards to an enemy who occupied the deep ravines, thick with tangled forest growth and vines, that seamed the river bluff. Braddock's ruinous error was in not beating up ahead on his flanks, as Col. Sir Peter Halket urgently besought him to do the night before; and he thereby marched straight into the worst of ambushes. Into these the Indians glided, while the white troops barred the English path in front; and the head of the advance column went down under a storm of lead. Shaken for a moment, the vanguard moved against the concentric ring; and after another terrible discharge, returned it with a volley that swept away every enemy in sight, and struck Beaujeu and a dozen others dead. The Indians turned to fly; rallied by the other French officers, they returned to cover, and under their unerring fire the English advance broke and retreated; mixing with the rear in the narrow path, both became mingled in a mob which Braddock could not restore to order. Huddled into a 12-foot road, shut in by a forest resounding with yells and filled with an invisible foe, they lost all sense of perception, and twice shot down bodies of their own men who had gained slight vantage points, taking their smoke for the enemy's. Fifty Virginians were thus slain at one volley. The regulars refused to charge, though Braddock, with four horses shot successively under him, and the other officers strove to hearten them to invade the wood; the provincials sought to fight Indian fashion behind trees and logs, but Braddock with furious threats and blows drove them back into rank again, where they fell in scores. Washington and Halket begged to have them allowed to leave the ranks, but Braddock still refused. The ammunition began to fail; the baggage was attacked; all Braddock's aides but Washington were shot down, three-fourths of the officers and three-fifths of the entire army; and only then would the ill-judging but heroic Braddock give the signal for retreat. Shortly afterward Braddock received a ball through the lungs; not one of the English soldiery would stay to carry him off the field, but one English and two American officers took him from the field to a spot half a mile across the river. Here the dying hero tried to establish a camp for a rallying place, and to care for the wounded and wait for Washington's return from Dunbar; but although the French and Indians had not followed them across, the 100 English soldiers he had induced to stop there stole away again and fled. The officers with their commander marched on till 10 P.M. on the 10th, when they halted and met the convoy from Dunbar, Braddock never ceasing to give calm, skilful and humane orders; on the 11th he reached Dunbar's camp, where the news of the rout had set his soldiers also deserting and fleeing in wild panic. Giving up all hope of the expedition in any hands now, he had the stores destroyed to keep them from the enemy, save enough for a flying march; and the remnant of the army proceeded toward Great Meadows, where Braddock expired, leaving his favorite horse and body servant to Washington. Of 1,460 men in the battle, 456 were killed and 421 wounded; 63 out of 89 commissioned officers were killed or injured, and every field officer. The enemy's casualties were about 60. The entire borders were left defenseless and desolated by a fearful Indian war. Consult Winthrop Sargent, 'History of the Expedition against Fort Du Quesne in 1755,' edited from the original manuscript (Philadelphia 1855).

BRADDON, Mary Elizabeth (MRS. JOHN MAXWELL), English novelist: b. London 1837; d. Richmond, 4 Feb. 1915; daughter of a London solicitor. She received her education at home, and at the age of 18 was contributing to a Brighton newspaper. After publishing some poems and tales, in 1862 she brought out 'Lady Audley's Secret,' which was almost instantly popular and the first of a long series of clever sensational novels, her total output reaching to over 60. She had an admirable gift in invention and was a born story teller. She conducted the London magazine *Belgravia* for a number of years and some of her stories first appeared there. Her husband was a well-known publisher and her son, W. B. Maxwell, is a distinguished novelist.

BRADENTOWN, Fla., city and county-seat of Manatee County, on the Manatee River, and on the Seaboard Air Line and the Atlantic Coast Line railroads. It is about five miles from the shores of Tampa Bay. The surrounding district produces quantities of winter vegetables and citrus fruits and the city has a large trade in these and contains two banks, county high, grammar and primary schools, courthouse, city hall, 16 miles of paved streets, a complete system of sanitary sewers, municipally owned waterworks, a public library, fruit packing houses, and an electric light system. The value of taxable property is $4,500,000. The city's receipts in a recent year amounted to $212,208 and the expenditures to $207,917. Pop. 4,000.

BRADFORD, Alden, American historian and journalist: b. Duxbury, Mass., 19 Nov. 1765; d. Boston, 26 Oct. 1843. Originally a Congregational minister he became secretary of State of Massachusetts (1812–24), and editor of the Boston *Gazette* (1826). He wrote 'History of Massachusetts, 1764–1820'; 'Speeches of the Governors of Massachusetts from 1765 to 1775' (1818); 'History of the Federal Government’; ‘Life of Jonathan Mayhew’ (1838); ‘New England Chronology’ (1843).

BRADFORD, Amory Howe, American clergyman and author: b. Granby, Oswego County, N. Y., 14 April 1846; d. 1911. He was graduated at Hamilton College 1867, Andover Theological Seminary 1870; studied at Oxford University, England, and became pastor of the First Congregational Church, Montclair, N. J., in the year last named. In 1896 as a member of the deputation from the American Board of Foreign Missions to investigate mission work he visited Japan and became president of the American Missionary Association in 1904. He wrote ‘Spirit and Life’ (1888); ‘Old Wine, New Bottles’ (1892); ‘The Pilgrim in Old England’ (1893); ‘Heredity and Christian Problems’ (1895); ‘The Growing Revelation’ (1897); ‘Art of Living Alone’ (1899); ‘The Return to Christ’ (1900); ‘Age of Faith’ (1900); ‘Spiritual Lessons From the Brownings’ (1900); ‘Ascent of the Soul’ (1902); ‘My Brother’ (1910); ‘Preludes and Interludes’ (1911).

BRADFORD, Andrew, American printer, son of William Bradford (q.v.): b. Philadelphia about 1686; d. 23 Nov. 1742. He was the only printer in Pennsylvania from 1712 to 1723. He published the first newspaper in Philadelphia, 22 Dec. 1719, called the *American Weekly Mercury.* It was by him that Benjamin Franklin was first employed, on his arrival in Philadelphia in 1723. In 1732 he was postmaster; in 1735 he kept a book store at the sign of the Bible in Second street. In 1738 he removed to No. 8 South Front street, to a house which in 1810 was occupied as a printing house by his descendant, Thomas Bradford, publisher of *True American.*

BRADFORD, Gamaliel, American writer and politician: b. Boston, Mass., 15 Jan. 1831; d. Boston, Mass., 20 Aug. 1911. He was prominent in politics as an independent, being a strong opponent of the Philippine policy of the administration, and published ‘Lesson of Popular Government’ (1898).

BRADFORD, Gamaliel, American author: b. Boston, Mass., 30 Oct. 1863. He was tutored privately until 1882, when he entered Harvard University, but was obliged to leave almost immediately on account of ill-health. With the exception of a little tutoring and lecturing he has occupied himself mainly with literary pursuits since 1886. He is a member of the Society of the Cincinnati, the Massachusetts Historical Society and the National Institute of Arts and Sciences. He is the author of ‘Types of American Character’ (essays 1895); ‘The Private Tutor’ (1904); ‘A Pageant of Life’ (1904); Between Two Masters’ (1906); ‘Matthew Porter’ (1908); ‘Studies of Robert E. Lee’ (1912); ‘Confederate Portraits’ (1914); Union Portraits’ (1916), and many general essays.

BRADFORD, John, Protestant martyr and theologian: b. Manchester about 1510; d. Smithfield, London, 1 July 1555. He obtained a situation in the commissariat, and having been guilty of some defalcation, known only to himself, was so impressed by a sermon of Latimer on restitution, that he determined not only to sell everything he had in order to make up the defalcation, but to renounce an employment which exposed him to dangerous temptations. He afterward studied at Cambridge, where he received the degree of M.A., and on taking orders was appointed chaplain to the bishop of London, and canon of Saint Paul’s. From this time he devoted himself to the duties of his office with so much zeal and success that he became one of the most popular preachers of his day. In 1552 he was appointed chaplain to Edward VI, but under the reign of Queen Mary became a marked man. On the charge of preaching sedition he was committed to the Tower (occupying the same room with Ridley, Cranmer and Latimer), and being brought to trial, was condemned to death as an obstinate heretic. His life is said to have been offered to him if he would only promise to refrain from preaching, but even this he had the manliness to refuse, and he was burned at the stake at Smithfield. A complete edition of his works, which include sermons, meditations, various treatises and a biography was published 1848–53, edited by Rev. Aubrey Townsend.

BRADFORD, Royal Bird, American naval officer: b. Turner, Me., 22 July 1844; d. Washington, 4 Aug. 1914. He was graduated at the United States Naval Academy in 1865 and received promotion through various grades to the rank of commander. He made a specialty of equipment, and in 1897 became chief of the Bureau of Equipment at the Navy Department in Washington, where he remained until his retirement as rear-admiral in 1906.

BRADFORD, Samuel, English bishop: b. Saint Anne’s, Blackfriars, 20 Dec. 1652; d. Westminster, 17 May 1731. He left the university without a degree on account of religious scruples; and though he had a strong religious bent, he took up the study of medicine. In 1680 he was ordained deacon and priest in 1690. He was a frequent preacher before the corporation of London and his sermons were always as strongly Protestant as he was himself Whig in politics. In 1698 he became one of the royal chaplains to William III; in 1708 he was made a prebendary of Westminster; in 1718 he was elected bishop of Carlisle and in 1723 he became bishop of Rochester and dean of Westminster. Two years later he became the first dean of the revived order of the Bath. He is buried in Westminster Abbey.

BRADFORD, William, American colonial governor and author: b. Austerfield, Yorkshire, England, 1590; d. Plymouth, 9 May 1657. He joined the Separatists or Brownists in 1606; persecutions followed; an attempt to reach Holland was frustrated; he was imprisoned, but ultimately reached Zealand and became apprenticed to a French Protestant silk manufacturer. He sailed with the *Mayflower* from Southampton (5 Sept. 1620) and was one of the signers of the celebrated compact signed on board; and, in 1621, on the death of the first governor, John Carver, was elected to the same office, which he continued to fill (with the exception of a brief period when he declined reelection) until his death. His administration was remarkably efficient and successful, especially in dealing with the Indians. One of his first acts was to adopt measures to confirm the league with the Indian sachem Massasoit. In the beginning of 1622, when the colony was subjected to a distressing famine, a threatening message was received from the sachem of Narragansett in the form of a bundle of arrows bound with the skin of a serpent. The governor sent back the skin filled with powder and ball. This decisive reply finished the correspondence. The Narragansetts were so terrified that they returned the skin without even inspecting its contents. In return for his kindness and attentions to Massasoit in a dangerous illness, the sachem disclosed to the colony a dangerous conspiracy among the Indians and it was suppressed. He opposed the system of communal holdings, the change to severalty being made in 1623; a council was appointed in 1624; he was given the title for the Plymouth Plantation in 1629 (relinquished 1635); and in 1634 saw representative institutions established in the infant colony by the sending of delegates from the towns. His ‹Diary of Occurrences,› covering the first year of the colony, was published in 1622. He left a number of religious compositions in verse; and historical prose writings of great value which are the principal authorities for the early history of the colony, the most important being his ‹History of the Plymouth Plantation› from the formation of the society in England, in 1602, down to 1647. This was for many years stored in Old South Church, Boston, disposed during the American Revolution, but was found in the library of Fulham Palace, England, in 1858, and in 1898 was returned to the United States and placed among the archives of Massachusetts. His works have been published in the Collections of the Massachusetts Historical Society. The shorter writings of Bradford will be found in Young's ‹Chronicles of the Pilgrims› (Boston 1841). See Cotton Mather, ‹Magnalia› for life of Bradford; also Tyler, ‹History of American Literature 1607–1765› (New York 1898); Walker, ‹Ten New England Leaders› (New York 1901).

BRADFORD, William, the first printer in Pennsylvania: b. Leicester, England, 20 May 1663; d. New York, 22 May 1752. A Quaker, he emigrated with Penn in 1682 and landed where Philadelphia was afterward built, before a house was begun. He went back to England, but returned in 1685, in which year he printed an almanac. In 1686, with some German colonists, he established near Philadelphia the first paper mill in America. The writings of George Keith, which he printed, having caused a quarrel among the Quakers, he was arrested in 1692 and imprisoned for libel and his press and types seized. On his trial, when the justice charged the jury to find only the fact as to the printing, Bradford maintained that they were to find also whether the paper was really seditious and that «the jury are judges in law as well as the matter of fact.» He was not convicted, but having incurred the displeasure of the dominant party in Philadelphia, he removed to New York in 1693. In that year he printed the laws of the colony. On 16 Oct. 1725, he began the first newspaper in New York and the fourth in America, called the New York *Gazette*. Being temperate and active, he reached a great age without sickness and walked about on the very day of his death. For more than 50 years he was printer to the government of New York and for 30 years the only one in the province. Consult Wallace, ‹An Address at the Celebration by the New York Historical Society of the 200th Birthday of William Bradford› (Albany 1863).

BRADFORD, William, American jurist, attorney-general of the United States and a great-grandson of William Bradford, the printer: b. Philadelphia, 14 Sept. 1755; d. 23 Aug. 1795. He was graduated at Princeton College in 1772 and commenced the study of the law. In the spring of 1776, upon the breaking out of the war with Great Britain, he joined the militia, in which he attained the rank of lieutenant-colonel. In consequence of ill-health he was obliged to resign at the end of two years and was admitted to the bar in Philadelphia in 1779. In 1780 he was appointed attorney-general of Pennsylvania. Under the new constitution he was appointed a judge of the Supreme Court 22 Aug. 1791. Upon the promotion of Edmund Randolph to the office of Secretary of State he received from Washington the appointment of Attorney-General of the United States 28 Jan. 1794. In early life he wrote some pastoral poems in imitation of Shenstone; but his principal literary production was an ‹Inquiry how far the Punishment of Death is necessary in Pennsylvania› (1793).

BRADFORD, England, manufacturing city and municipal, county and parliamentary borough, in the West Riding of Yorkshire, eight miles west of Leeds, on the Bradford Canal and the Midland, Northeastern, Great Northern and Lancashire & Yorkshire railways. It is pleasantly situated on a feeder of the Aire, at the junction of three extensive valleys, and consists of an ancient and a more modern portion, the latter with spacious, well-built streets. The appearance of the town has been almost completely changed since 1861, the corporation having, at a great expenditure of money, effected most extensive street improvements, widening the principal thoroughfares, improving the gradients and opening up new streets. Spacious covered markets have been erected at a great cost. Among the public buildings are the town hall (1873), in French Gothic style; the parish church of Saint Peter, in the Perpendicular style, dating from 1485; the Cartwright Memorial Hall, containing an art gallery and museum, opened in 1904, to commemorate the inventor of the power-loom and combing machine; Saint George's Hall, erected in 1853, and capable of accommodating about 4,000 persons; an exchange, containing a statue of Cobden; a temperance hall, the first of the kind in England, erected in 1837; a mechanics' hall, with lecture-rooms and library; a technical college, opened in 1882; free library (1872). The schools include the free grammar school, endowed by Charles II, the girls' grammar school and the board schools. In Airedale College young men are trained for the ministry among the Independents and there is also a United Independent college (1888). Among the charitable institutions may be noticed the infirmary, the eye and ear hospital, the children's hospital, Saint Catharine's Home, an institution for the blind, and almshouses. There is a fever hospital, to which patients are admitted at moderate charges, and when persons are too poor to pay, the corporation bears the cost. There is also a smallpox hospital. Bradford has several public parks, some of them finely laid out, besides Baildon Moor (600 acres) reserved for recreation purposes. There is an extensive system of waterworks by gravitation, representing an outlay of more than $18,000,000, and water, gas and electric supply undertakings are owned by the municipality. In 1907 a municipal railway was opened, extending into the Nidd Valley, from whence the main water supply of the city is obtained. Bradford is the headquarters in England of the worsted yarn and stuff trade, which is the principal industry, the alpaca and mohair manufactures (with which Sir Titus Salt's name is connected), having been transferred to the village of Saltaire, near Shipley. There are also manufactures of silk and velvet (the Manningham Mills of Lister & Company), mixed cotton and silk goods; and some cotton factories. In 1916 goods to the amount of $14,452,210 were shipped from Bradford to the United States, the largest items being woolen dress goods, $1,067,108, and piece-dyed cotton cloth, $4,754,972. In the neighborhood are quarries and ironworks. The town was incorporated in 1847 and its affairs are managed by a lord mayor (dignity conferred in 1907), 21 aldermen and 63 councillors. It was accorded the rank of a city in 1897. A United States consulate is established here. Pop. 288,505. Consult Ogden, 'Bradford' (London 1910) and *The Bradford Antiquary,* journal of the Bradford Historical and Antiquarian Society (Bradford 1888 to date).

BRADFORD, Pa., city in McKean County, on several railroads, 15 miles northwest of Smethport, the county-seat, and 75 miles south of Buffalo, N. Y. It is in an extensive coal, oil and natural gas region and is principally engaged in industries connected therewith, besides having machinery, chemical, boiler, vacuum cleaner, furniture, gas-engine, cutlery and brick and tile works. The city has electric street railroads, daily and weekly newspapers, three national banks, large hospital, several libraries, an opera house, driving park, and is lighted and heated by natural gas. Bradford was settled in 1823, chartered as a city in 1879 and adopted the commission form of government in 1914. The waterworks are owned and operated by the city. Pop. (1920) 15,525.

BRADFORD-ON-AVON, England, an ancient market-town in Wiltshire, beautifully situated 28 miles northwest of Salisbury, on both banks of the lower Avon, here crossed by two bridges — a very old one of nine arches in the centre of the town, and a modern one, Barton Bridge, of four. The town chiefly consists of three regular streets, containing many handsome houses. There is a good parish church of the Holy Trinity, in the Norman and subsequent styles; a town hall, in Elizabethan style; and some interesting old buildings. Among the latter is the small but unique church of Saint Laurence, the only complete specimen of Anglo-Saxon architecture still existing and of great archæological interest. It is believed to have been built in the 8th century by Saint Aldhelm and consists of a chancel, a nave and a porch on the north side. Woolen cloth is manufactured, but this industry has declined. Bradford was of some note in Anglo-Saxon times, Saint Dunstan having been elected bishop of Worcester at a synod held here. Pop. 4,501. Consult Perkins, 'Abbey Churches of Bath, Malmsbury, and St. Laurence' (1901).

BRADLAUGH, brăd-lâ, **Charles,** English secularist: b. London, 28 Sept. 1833; d. 30 Jan. 1891. In his youth a private soldier, he made himself known by his free thought and republican writings and lectures, and more especially by his efforts to gain admission to Parliament. Being elected for Northampton in 1880, he claimed the right to make affirmation simply, instead of taking the oath which members of Parliament take before they can sit and vote, but being a professed atheist this right was denied him. Though repeatedly re-elected by the same constituency, the majority of the House of Commons continued to declare him disqualified for taking the oath or affirming; and it was only after the election of a new Parliament in 1885 that he was allowed to take his seat without opposition as a representative of Northampton. He was for many years editor of the *National Reformer.* Not long before his death Parliament erased from its records its resolutions prohibiting him from taking the oaths. Consult 'Life' (1894) by his daughter, Mrs. Hypatia B. Bonner, and J. M. Robertson.

BRADLEY, Andrew Cecil, English educator and author. He was educated at Cheltenham College and at Balliol College, Oxford. He was made a fellow of Balliol in 1874, and was lecturer there from 1876 to 1881, when he was appointed professor of modern literature at University College, Liverpool. In 1889 he went to Glasgow University as professor of English language and literature, remaining in that relation until 1900, when he was appointed professor of poetry at Oxford. He has published 'A Commentary on Tennyson's In Memoriam' (1901); 'Shakespearean Tragedy' (1904); 'Oxford Lectures on Poetry' (1909).

BRADLEY, Arthur Granville, English author, son of George Granville Bradley (q.v.): b. 11 Nov. 1850. He was educated at Marlborough and Trinity College, Cambridge, and has published 'Life of Wolfe' (1895); 'Sketches from Old Virginia' (1897); 'Highways and Byways of North Wales' (1898); 'The Fight with France for North America' (1900); 'Highways and Byways of the English Lake District' (1901); 'Highways and Byways of South Wales' (1903); 'Canada in the Twentieth Century' (1903); 'The March and Borderland of Wales' (1905); 'Round About Wiltshire' (1907); 'Life of Guy Carleton' (1907); 'The Romance of Northumberland' (1908); 'The Making of Canada' (1910); 'The Wye' (1910); 'Britain Across the Seas, America' (1911); 'The Gateway of Scotland' (1912); 'Other Days' (1913); 'Clear Waters' (1915).

BRADLEY, Edward (CUTHBERT BEDE), English author and clergyman: b. Kidderminster 1827; d. Lenton, 12 Dec. 1889. He was graduated at Durham University, and was rector of Denton, Stretton and finally Lenton from 1883 until his death. He contributed to *Punch* and other London periodicals, and published the 'Adventures of Mr. Verdant Green, an Oxford

Freshman› (London 1855), a humorous picture of college life. His other works include ‹Mr. Verdant Green Married and Done For› (1856); ‹The White Wife,› a collection of Scottish legends (1864); ‹Little Mr. Bouncer and His Friend, Verdant Green› (1873–74); and several books of travel.

BRADLEY, Francis Herbert, English writer on philosophy: b. Glasbury 1846. He was educated at Cheltenham and at Marlborough College. He is a fellow of Merton College, Oxford, and has written many works on philosophical subjects. His publications include ‹The Presuppositions of Critical History› (1874); ‹Ethical Studies› (1876); ‹The Principles of Logic› (1883); ‹Appearance and Reality› (1893); ‹Essays on Truth and Reality› (1914).

BRADLEY, George Granville, English clergyman, dean of Westminster Abbey, 1881–1902; b. 11 Dec. 1821; d. London, 12 March 1903. He was educated at Rugby and University College, Oxford, and took orders in the Anglican Church. He was assistant master at Rugby 1846–58; master of Marlborough College 1858–70; master of University College 1870–81. From 1874 to 1876 he was honorary chaplain to the Queen. In the last named year he became a canon of Worcester and succeeded Dean Stanley as dean of Westminster. He published ‹Recollections of Arthur Penrhyn Stanley› (1883); ‹Lectures on the Book of Job› (1884); ‹Lectures on Ecclesiastes› (1885). He resigned the deanery of Westminster a few months before his death.

BRADLEY, Henry, English scholar and lexicographer: b. Manchester, England, 3 Dec. 1845. Successively teacher, commercial clerk and foreign correspondent and journalist, he has twice been president of the Philological Society and has been joint editor of the ‹Oxford English Dictionary› from 1889. He has published ‹The Story of the Goths› (1888); ‹The Making of English› (1904); and contributed important articles to the ‹Dictionary of National Biography› and elsewhere.

BRADLEY, James, English astronomer: b. Sherborne, Gloucestershire, 1693; d. Chalford, Gloucestershire, 13 July 1762. He was educated at Balliol College, Oxford, and took orders, but his taste for astronomy soon led him in a different direction, and in 1721 he was appointed Savilian professor of astronomy at Oxford. Seven years afterward he made known his discovery of the aberration of light. But although this discovery gave a greater degree of accuracy to astronomical observations, yet slight differences remained which he studied during 20 years with the greatest perseverance, and finally discovered that they were fully explained by the supposition of an oscillating motion of the earth's axis, completed during a revolution of the moon's nodes, that is, in about 18 and a half years. He called this phenomenon the «nutation of the earth's axis»; and published his account of it in 1748, for which he received the Copley medal. By these two discoveries astronomers were, for the first time, enabled to make tables of the motions of the heavenly bodies with the necessary accuracy. Bradley had already, in 1726, explained the method of obtaining the longitude by means of the eclipse of Jupiter's first satellite. In 1742, at the death of Dr. Halley, he received the office of astronomer royal, and removed to the observatory at Greenwich. Here he spent the remainder of his life, entirely devoted to astronomical studies. His observations in manuscript appeared under the title of ‹Astronomical Observations made at the Observatory at Greenwich, 1750–62› (1798, 1805). From this rich mine have been taken thousands of observations on the sun, moon and planets of the highest astronomical value. The value of these observations was enormously increased by Bessel, who undertook their systematic reduction and extracted from them the catalogue of 3,222 stars which he published under the title of ‹Fundamenta Astronomiæ.›

BRADLEY, John Edwin, American educator: b. Lee, Mass., 8 Aug. 1839; d. 7 Oct. 1912. He was graduated from Williams College in 1865, and was successively principal of high schools in Pittsfield, Mass., 1865–68; Albany, N. Y., 1868–86. He was superintendent of schools at Minneapolis 1886–92, and president of Illinois College 1892–1900. He is the author of ‹Science and Industry›; ‹School Incentives›; ‹Healthfulness of Intellectual Pursuits›; ‹Work and Play›; ‹Talks With Students.›

BRADLEY, Joseph Philo, American jurist: b. Berne, N. Y., 14 March 1813; d. Washington, D. C., 22 Jan. 1892. He was graduated at Rutgers College in 1836; admitted to the bar in 1839, and became a justice of the United States Supreme Court in 1870. As a member of the electoral commission he cast the vote which gave the presidency to Hayes in 1877. He devoted much time to mathematical study. His ‹Miscellaneous Works and Correspondence› was published in 1832.

BRADLEY, William O'Connell, American lawyer and legislator: b. near Lancaster, Garrard County, Ky., 18 March 1847; d. 23 May 1914. Admitted to the bar in 1865 and serving at prosecuting attorney of Garrard County in 1870, as presidential elector in 1872, he came into nation-wide prominence at the Republican convention of 1880, making the speech seconding the nomination of Grant for President; again in 1904 in a powerful speech seconding the nomination of Roosevelt for President. In 1888 he had received 105 votes for Vice-President in the national convention, and in 1896 was endorsed for President by the Kentucky State convention. From 1895 to 1899 he was governor of Kentucky, and was a member of the Republican National Committee during 17 years. He was elected United States senator for the term 1909–15. He was one of the most eloquent and popular orators at national conventions, and only a few days before his death made a three hours' speech opposing the Panama Canal tolls repeal bill, which was considered a particularly forcible presentation of the case.

BRADSHAW, John, English judge and regicide: b. Cheshire, England, 1602; d. London, 31 Oct. 1659. He studied law at Gray's Inn, and obtained much chamber practice from the partisans of the Parliament, to which he was zealously devoted. When the trial of the King was determined upon, the resolute character of Bradshaw pointed him out for president of the high court of justice, which office, after a slight hesitation, he accepted. His deportment on the trial some described as lofty and unbending, others as harsh and overbearing. He was subsequently appointed permanent president of the council of state, and chancellor of the duchy of Lancaster; he also received a grant of estates worth £2,000 per annum. He rendered himself obnoxious to Cromwell, when the latter seized the protectorate, and was deprived of the chief justiceship of Chester. On the death of Cromwell in 1658 and the restoration of the Long Parliament, he obtained a seat in the council and was elected president. He died in 1659, and on his deathbed asserted that, if the King were to be tried and condemned again, he would be the first to agree to it. He was magnificently buried in Westminster Abbey, from which his body was ejected and hanged on a gibbet at Tyburn, with those of Cromwell and Ireton, at the Restoration.

BRADSHAW, William, Puritan minister: b. Market Bosworth, Leicestershire, England, 1571; d. 1618. After graduation from Cambridge College (1595) he became tutor in the family of Sir Thomas Leighton, governor of Guernsey, where he came under the influence of Thomas Cartwright, the famous Puritan leader, who was preaching in the neighborhood. Later he entered the ministry, became fellow in Cambridge and was forced to leave the university on account of having distributed the writings of John Darrel. He preached for a time at Chatham, where he was very popular; but he was suspended on a charge of teaching unsound doctrine. He found a friend in the bishop of Coventry, who granted him a license to preach in any part of his diocese. Bradshaw was very much opposed to ceremonies, which he declared to be unlawful in themselves and imposed by prelates without due authority and he published anonymous tracts against them. In 1605 he published ‘English Puritanism,’ in which he strongly advocated the independence of congregations and the purification of the Church. He also held that no clergyman should hold any civil office. This book stirred the Church authorities against him; and he was forced to go to Derbyshire where he found a safe retreat. From there he continued fighting for the cause he had so much at heart and his views were carried far and wide by his own publications and those of his friends and followers. His remarks, which are generally of controversial nature, are very numerous. His ‘English Puritanism’ went through several editions and was translated into Latin and since into several modern languages. Consult Neal, ‘History of the Puritans’; Barclay, ‘Inner Life of the Religious Societies of the Commonwealth’ (1876).

BRADSTREET, Anne, American poet: b. Northampton (probably), England, 1612; d. Andover, Mass., 16 Sept. 1672. She was the daughter of Gov. Thomas Dudley and married the future governor, Simon Bradstreet, in 1628. She went with him to New England in 1630. She was the first woman of letters in America, her verse being written in the intervals of household cares and by her contemporaries was styled “The Tenth Muse.” Her volume of poems was published in London in 1650. A more complete edition appeared at Boston in 1678, containing, among other additional compositions, her best poem entitled ‘Contemplations.’ A third edition was published in 1758. She was the mother of eight children, to whom she makes the following allusion:

> I had eight birds hatch’t in the nest;
> Four cocks there were, and hens the rest;
> I nurs’t them up with pains and care,
> For cost nor labor did I spare;
> Till at last they felt their wing,
> Mounted the trees and learned to sing.

Her complete works, edited by J. H. Ellis, were reprinted in Boston in 1867, and again in 1897. Consult Tyler, ‘American Literature’ (1898); and Wendell, ‘A Literary History of America’ (pp. 36, 40, 119, New York 1900).

BRADSTREET, John, English soldier in America: b. 1711; d. New York, 21 Oct. 1774. In 1745 he served in the Louisburg expedition as lieutenant-colonel in Pepperell’s regiment and later in the year was raised to the rank of captain. He was, in 1746, lieutenant-governor of Saint Johns, Newfoundland, and in 1755 became adjutant-general under General Shirley. In 1756, when it was considered highly important to keep open the communication with Fort Oswego, on Lake Ontario, he was placed at the head of 40 companies of boatmen, raised for the purpose of supplying it with stores from Schenectady. On his return, 3 July 1756, with 300 of his force he was attacked from an ambuscade, on the Onondaga River, but repulsed and routed the enemy with great loss. In 1758 he took part in the attack on Fort Ticonderoga and immediately thereafter became quartermaster with the rank of colonel. In the same year, he commanded a force of 3,000 men in the expedition against Fort Frontenac, which was surrendered 27 August, with all its military stores, provisions and merchandise, on the second day after he commenced the attack. In 1764 he advanced with a considerable party toward the Indian country during the conspiracy of Pontiac and made a treaty of peace with the various tribes at Detroit. He was appointed major-general in 1772.

BRADSTREET, Simon, American colonial governor: b. Horbling, Lincolnshire, England, March 1603; d. Salem, Mass., 27 March 1697. Left an orphan at the age of 14, he was brought up under the care of Thomas Dudley (q.v.), whose daughter Anne he married. For a time he was steward to the Earl of Lincoln and later to the Countess of Warwick. He, with Dudley and Winthrop, determined to emigrate and form a settlement in Massachusetts. Embarking with his wife on the *Arbella,* 29 March 1630, they anchored off Salem on 12 June. In 1631 Bradstreet was one of those who commenced building at Newtown, now Cambridge, and he resided there for several years. In 1639 he was granted 500 acres of land at Salem. He was also one of the first settlers of Andover, building in 1644 the first mill on the Cochichewick. After the death of his wife in 1672, he seems to have spent his time mainly in Boston and Salem. He was the colony’s first secretary, one of the first commissioners of the United Colonies in 1643 and in 1653 vigorously opposed making war on the Dutch in New York and on the Indians; and it was prevented by his steady and conscientious opposition and the decision of the General Court of Massachusetts. He was deputy governor from 1672 until his election as governor in 1679, in which office he continued until 1686. When Charles II demanded the colony's charter, Bradstreet thought it better that it should be surrendered than that it should be taken away by judgment. He opposed the arbitrary proceedings of Andros, and when, in 1689, the people put down his authority, they made their former governor their president and he continued as the head of the administration till May 1692, when Gov. William Phipps arrived, bringing the new charter, in which Bradstreet was named as first assistant. For 62 years he had been in the service of the colony, and he lived to be the "Nestor of New England," for all who came over from England with him died before him. He was a popular magistrate and official, a man of integrity and piety and one of the few who stoutly opposed the witchcraft delusion of 1692. Consult *New England Historical and Genealogical Register* (Vol. I, pp. 75–76, and Vol. VIII, p. 325) for a reprint of his 'Journal, 1664–83.'

BRADWARDINE, brăd'wėr-dĭn, or **BREDWARDINE, Thomas** (Doctor Profundus), English scholar: b. Hartfield, Sussex, about 1290; d. 1349. He was distinguished for his varied learning and more particularly for his treatise, 'De Causa Dei Contra Pelagium,' an extensive work against the Pelagian heresy, for centuries a standard authority. He was chaplain and confessor to Edward III, whom he accompanied to France, being present at Cressy and the capture of Calais. Being appointed archbishop of Canterbury, he hastened to England, but died of the black death on reaching London. Other works by him are 'De Geometria Speculativa'; 'De Proportionibus'; 'De Quadratura Circuli'; 'De Arithmetica Practica.' Consult Hahn, 'Thomas Bradwardinus' (Münster 1905).

BRADWARDINE, Baron, a character in Scott's novel of 'Waverly.' He is represented as a rather opinionated retired soldier, living at his seat of Tully Vedlan.

BRADY, Cyrus Townsend, American clergyman: b. Allegheny, Pa., 20 Dec. 1861; d. 24 Jan. 1920; graduate, United States Naval Academy 1883; LL.D., Saint John's College, Md., 1902; was in railway service with the Missouri Pacific and Union Pacific roads for several years; studied theology under Bishop Worthington of Nebraska; deacon 1889, priest 1890, of the Protestant Episcopal Church; rector of Protestant Episcopal churches in Missouri and Colorado and archdeacon of Kansas until 1885 and archdeacon of Pennsylvania until 1899; rector of Saint Paul's Church, Overbrook, Philadelphia, 1899–1902; was engaged in literary work 1902–05; rector of Trinity Church, Toledo, 1905–09; Saint George's Church, Kansas City, Mo., 1909–13; Church of the Ascension, Mount Vernon, N. Y., 1913–14; special preacher at Saint Stephen's Church, New York, after 1914; was chaplain 1st Pennsylvania Volunteer Infantry in the Spanish-American War; member S. A. R. Military Order of Foreign Wars, Society of Colonial Wars, etc.; author of the following books, many of which have been filmed: 'For Love of Country' (1898); 'For the Freedom of the Sea' (1899); 'The Grip of Honor' (1899); 'Stephen Decatur' (1900); 'Recollections of a Missionary in the Great West' (1900); 'American Fights and Fighters' (1900); 'Commodore Paul Jones' (1900); 'Reuben James' (1900); 'When Blades are out and Love's Afield' (1901); 'Under Tops'ls and Tents' (1901); 'Colonial Fights and Fighters' (1901); 'The Quiberon Touch' (1902); 'Hohenzollern' (1902); 'Woven With the Ship' (1902); 'In the Wasp's Nest' (1902); 'Border Fights and Fighters' (1902); 'Tittlebat Titmouse' (1903); 'The Southerners' (1903); 'The Bishop' (1903); 'Sir Henry Morgan, Buccaneer' (1903); 'A Doctor of Philosophy' (1903); 'A Corner in Coffee' (1904); 'The Records' (1904); 'A Little Traitor to the South' (1904); 'A Midshipman in the Pacific' (1904); 'Indian Fights and Fighters' (1904); 'Conquest of the Southwest' (1905); 'The Two Captains' (1905); 'Three Daughters of the Confederacy' (1905); 'My Lady's Slipper' (1905); 'The Patriots' (1906); 'The True Andrew Jackson' (1906); 'Richard the Brazen' (1906); 'The Free Lances' (1907); 'Gethsemane and After' (1907); 'Northwestern Fights and Fighters' (1907); 'The Love Test' (1908); 'The Blue Ocean's Daughter' (1908); 'The Adventures of Lady Susan' (1908); 'By Wild Waves Tossed' (1908); 'The Ring and the Man' (1909); 'On the old Kearsarge' (1909); 'The Island of Regeneration' (1909); 'South American Fights and Fighters' (1910); 'The Better Man' (1910); 'Bob Dashaway, Privateersman' (1911); 'As the Sparks Fly Upward' (1912); 'The Chalice of Courage' (1912); 'The Master of Repartee' (1912); 'Bob Dashaway, Treasure Hunter' (1912); 'The Fetters of Freedom' (1913); 'The Island of the Stairs' (1913); 'Bob Dashaway in the Frozen Seas' (1913); 'A Christmas When the West Was Young' (1913); 'The Sword Hand of Napoleon' (1914); 'Britton of the Seventh' (1914); 'The Little Angel of Canyon Creek' (1914); 'The Eagle of the Empire' (1915); 'A Baby of the Frontier' (1915); 'The Island of Surprise' (1915); 'By the World Forgot' (1917); and 'When the Sun Stood Still' (1917).

BRADY, Edwin J., Australian poet: b. Carcoar, N. S. W., 7 Aug. 1869. He was graduated from Sydney University and entered journalism, becoming editor of the *Native Companion Magazine.* He developed a distinctive, forcible style that soon attracted attention and made him one of the favorite young writers of Australia. So excellent has been his work that a serious English critic qualified his 'The King's Caravan' as "undoubtedly quite the best book yet written in Australia." It gives a very picturesque account of roving life on the Australian highroad. It is vivid and bears about it an atmosphere of reality that is racy of the country. Among Brady's other works are 'The Ways of Many Waters'; and the 'Earthen Floor.'

BRADY, James Henry, American legislator: b. Indiana County, Pa., 12 June 1862; d. 13 Jan. 1918; educated, State Normal School.

Leavenworth, Kan.; removed to Idaho in 1894, became president of the Idaho Consolidated Power Company and also president of the Western Development Association. In political life he accepted the chairmanship of the advisory board of the National Council of Women Voters; from 1904 to 1908 was chairman of the Idaho Republican State Central Committee and governor of Idaho 1909–11. In 1913 he was elected United States senator for the unexpired term to 1915 of the late Weldon B. Heyburn, and re-elected 3 Nov. 1914 for the term ending 3 March 1921.

BRADY, James Topham, American lawyer: b. New York, 9 April 1815; d. there, 9 Feb. 1869. He was educated by his father, an eminent jurist, and admitted to the bar in 1836. His eloquence, skill and ability at once brought him reputation and a fine practice. In 1843 he was appointed district attorney for New York County and, in 1845, corporation counsel of New York. Conspicuous for his knowledge in all departments of law, he won verdicts from judges and jurors alike in important patent cases, such as Goodyear v. Day; cases involving questions of medical jurisprudence, like the Allaire and Parish will cases, the Huntington forgery case and Cole homicide case; divorce cases, like that of Mrs. Edwin Forrest, and civil actions of all kinds. He was at his best in criminal cases, where he usually appeared on the side of the defense. At one time he defended successfully in a single week four clients charged with murder. In 1859 he was counsel for Daniel E. Sickles in his trial for the assassination of Philip Barton Key, his opening address for the defense being one of his most notable forensic efforts. In 1860 he was the candidate of the pro-slavery Democrats for governor of New York. Though a States-rights advocate before the war, he supported Lincoln's war measures, making speeches which had considerable influence. He contributed largely to newspapers and magazines.

BRADY, Tex., city and county-seat of McCulloch County, 105 miles northwest of Austin, on the Gulf, Colorado and Santa Fe and the Frisco Lines railroads. Cotton, cattle, mohair and wool are important products of the region. The city's industries include cotton gins, compresses, cotton-seed-oil mills, planing mills, a creamery and a refrigerating plant. The city was incorporated in 1906, and owns the electric-lighting plant and waterworks. The government is vested in a mayor and board of aldermen. Pop. 2,669.

BRAGA, Theophilo, Portuguese philologist, critic and statesman: b. San Miguel, Azores, 24 Feb. 1843. He was educated at the University of Coimbra and became professor of literature in the Curso Superior de Letras in Lisbon. He is a very voluminous writer and takes important rank as a historian of the literature of the Iberian Peninsula. He is also noted as an exponent of the Comtian philosophy. In politics he has been prominent as an active democrat and became the first President of the republic of Portugal, 5 Oct. 1910. His philological work has been confined to the languages and literatures of the Spanish Peninsula, to which he has made several important contributions. Among his works may be mentioned 'Stella Matutina' (1863); 'Tempestades Sonoras' (1864); 'Torrentes' (1868), and a collection entitled 'Alma Portugueza' (1893). Of his other works may be noted 'Historia da Litteratura Portugueza' (1870–81); 'Manual da Litteratura Portugueza' (1875); 'Parnaso Portuguez Moderno' (1877); a volume on Camöens (1880); 'Traços Geraes de Philosophia Positiva' (1883); 'Systema de Sodo Povo Portuguez' (1883); 'Systema de Sociologia' (1884); 'Historia da Universidade de Coimbra' (1892).

BRAGA, brä′gä, Portugal, town in the province of Minho and its capital, situated on a rising ground between the Cavado and D'Este, about 32 miles north-northeast of Oporto. It is surrounded by walls flanked with towers and defended by a castle. The houses are old, the streets broad but not well laid out. It is the seat of an archbishop who is primate of Portugal, and contains an archiepiscopal palace, a richly ornamented Gothic cathedral of the 13th century, parish churches, monasteries, a college, etc. The manufactures are of some importance. Hats, arms, textiles and gold and silver articles are produced. Braga is supposed to have been founded by the Carthaginians and there exist remains of a Roman temple, amphitheatre and aqueduct. On a hill some distance east of the town stands the famous pilgrimage church of Bom Jesus do Monte. Braga was the capital of Lusitania, and two councils were held here in the 6th century at which the Arian and Priscillianist heresies were respectively condemned. Pop. about 25,000.

BRAGANÇA, brä-gän′sä, the name of two considerable towns in Brazil: (1) A seaport of Pará, State, at the mouth of the Rio Caite. It is 110 miles northeast of Pará, with which it is connected by rail. Pop. of town and district 6,000. (2) An inland city of about 10,000 inhabitants, 50 miles northeast of Sao Paulo, with which it is connected by rail, and about 200 miles to the west of Rio de Janeiro.

BRAGANÇA, or **BRAGANZA,** Portugal, the capital of a district (of the same name) in the province of Traz-os-Montes. It was in former times the capital of the province and is a place of considerable importance. It has the ruins of an ancient castle, one of the finest feudal remains in Portugal. It is the see of a bishop and there is an extensive manufactory of velveteens, printed calicoes and woolens. Bragança has given its name to the present royal family of Portugal. Pop. about 5,500.

BRAGANÇA, or **BRAGANZA, House of,** the reigning house of Portugal from 1578 to 1910, derived from Affonso, Duke of Bragança, a natural son of João I, King of Portugal. The constitution of Lamego, 1139, declared that no foreign prince could succeed to the throne; consequently in 1578, on the death of the Portuguese hero, Sebastian, in Africa, without issue, his people had recourse to the illegitimate line of Bragança. Philip II of Spain, however, claimed the throne and supported his pretensions by an army under the Duke of Alva, who, though in disgrace, was summoned from his retreat for this express purpose. In 1668 the Portuguese shook off the Spanish yoke. In 1801 Napoleon I declared that the line of the Bragança sovereigns had ceased. John, regent of the kingdom, withdrew to Brazil in

1807 but returned in 1821. At his death in 1826, his son Dom Pedro, resigned the throne in favor of his daughter, Maria da Gloria, preferring to remain Emperor of Brazil, to which office he had been elected by the Brazilians, 18 Nov. 1825. Although the male line became extinct both in Portugal and in Brazil, the female line (Saxe-Coburg-Gotha-Braganza) was represented on the Portuguese throne until the expulsion of Manoel II (q.v.) and the proclamation of the republic of Portugal, 5 Oct. 1910.

BRAGG, Braxton, Confederate general: b. Warren County, N. C., 22 March 1817; d. Galveston, Tex., 27 Sept. 1876. After graduation at West Point in 1837, he was appointed second lieutenant in the 3d Artillery (1 July 1837); served in the Seminole War in Florida in 1837–39 and 1841–42; took part in the military occupation of Texas 1845–46; and distinguished himself during the Mexican War under General Taylor, being brevetted captain (9 May 1846), major (23 Sept. 1846) and lieutenant-colonel (23 Feb. 1847), respectively, for bravery and gallantry at Fort Brown, Monterey and Buena Vista. After this war he was on garrison duty at various places, declining promotion to major of the 1st Cavalry 3 March 1855, and on 3 Jan. 1856 resigned his commission and became a sugar planter in Louisiana, from 1859–61 serving as commissioner of public works of Louisiana. At the beginning of the Civil War he joined the Confederate army and was rapidly promoted, becoming brigadier-general 7 March 1861, major-general 12 Sept. 1861 and lieutenant-general 12 April 1862. At first he was placed in command of the troops stationed at Pensacola for the purpose of operating against Fort Pickens and on 8 Oct. 1861 broke up the Federal camp on Santa Rosa Island, Fla.; but early in 1862 was sent west to act under Gen. A. S. Johnston (q.v.), commanding the Army of the Mississippi, and played an important part in the bloody battle of Shiloh (q.v.) 6–7 April. After Johnston's death Bragg was promoted general, placed in command of the Army of the Mississippi and shortly afterward superseded Beauregard (q.v.) in command of the Western department. In August 1862 he began his campaign to win the adherence of Kentucky to the Confederate cause, captured Munfordsville 17 September, moved on Bardstown and Frankfort but was beaten in the race for Louisville by the Federal general, D. C. Buell (q.v.). On 8 October Bragg practically defeated Buell at Perryville (q.v.), but owing to the arrival of heavy Federal reinforcements was compelled to abandon his dead and wounded, a large part of his spoils and hastily to withdraw into Tennessee. This brought him into disfavor, but, though some urged his removal, President Davis always sustained him and continued him in his command. At Stone River or Murfreesboro (q.v.), 31 Dec. 1862 to 2 Jan. 1863, he was defeated by the Federal forces, then under Gen. W. S. Rosecrans (q.v.); he fell back upon Tullahoma, but by the summer of 1863 had been outgeneraled by Rosecrans (see TULLAHOMA CAMPAIGN) and once more retreated. On 19–20 September, however, he turned upon Rosecrans at Chickamauga (q.v.) and inflicted a serious defeat upon the Federal army, only, in turn, to be disastrously defeated at Chattanooga (q.v.) 23–25 November, by Grant, who compelled his withdrawal to Dalton. On 2 Dec. 1863 he was removed from command, but on 24 Feb. 1864 was appointed to the office of military adviser to President Davis. In the following November he assumed command of the Department of North Carolina, in December defended Fort Fisher against the Porter-Butler attack, later led an unsuccessful expedition into Georgia against Sherman and in February 1865 was placed in active service under Gen. J. E. Johnston (q.v.), with whom he remained until his surrender. In 1869 he was superintendent of the New Orleans waterworks, later was chief engineer of the State of Alabama (in which capacity he supervised the work of improving the river, harbor and bay of Mobile) and in 1874 was chief engineer of the Gulf, Colorado and Santa Fé Railroad.

BRAGG, Edward Stuyvesant, American legislator: b. Unadilla, N. Y., 20 Feb. 1827; d. 20 June 1912. He was educated at Geneva (Hobart) College and admitted to the New York bar 1848. Removed to Fond du Lac, Wis., and was admitted to the Wisconsin bar 1850, to that of Illinois 1869, and to that of the United States Supreme Court 1877. He served in the Union army during the Civil War and won his way to the rank of brigadier-general. He was a member of the Union convention at Philadelphia in 1866, representative in Congress in 1877–85 and a delegate to the Democratic National Conventions of 1872, 1884, 1892 and 1896. In the convention of 1884 he seconded the renomination of Grover Cleveland, when he uttered the memorable phrase, «We love him for the enemies he has made.» In 1888 he was appointed minister to Mexico; from 15 May to 15 Sept. 1902, consul-general in Havana; from 1902 to 1906, at Hongkong.

BRAGI, brā'jē, the Scandinavian god of poetry. He is represented as an old man with a long, flowing beard, like Odin, yet with a serene and unwrinkled brow. His wife was Idun.

BRAHE, Tycho, tī'kō brä, or brā, Swedish astronomer: b. Knudstrup, near Lund, 14 Dec. 1546; d. Prague, Bohemia, 24 Oct. 1601. The district where he was born was then a province of Denmark, but the family was of Swedish origin. He was sent at the age of 13 to the University of Copenhagen with the intention that he should be educated for government service. He evinced great promise as a Latin scholar, but an eclipse of the sun turned his attention to astronomy. His uncle sent him later to Leipzig to study law, but Brahe, while his tutor slept, busied himself nightly with the stars. He succeeded, as early as 1563, in detecting grave errors in the Alphonsine tables and the so-called Prutenic (that is, Prussian) tables, and set about their correction. The death of an uncle, who left him an estate, recalled him to his native place in 1565; but he very soon became disgusted with the ignorance and arrogance of those moving in the same sphere with himself, and went back to Germany. At Wittenberg, where he resided for a short time, he lost part of his nose in a duel with a Danish gentleman; but for the lost organ he ingeniously contrived one of gold, silver and wax, which fitted admirably. After two years spent in Augsburg, he returned home, where, in 1572, he discovered a new and brilliant star in the constellation Cassiopeia. In 1573 he married a peasant girl. After some time spent in travel, Brahe received from his sovereign, Frederic II, the offer of the small island of Hven or Hoëne, in the sound, 10 miles from Copenhagen, as the site for an observatory, the king also offering to defray the cost of erection, and of the necessary astronomical instruments, as well as to provide him with a suitable salary. Brahe accepted the proposal, and, in 1576, the castle of Uraniborg («fortress of the heavens») was begun. Here, for a period of 20 years, Brahe prosecuted his observations with the most unwearied industry. Here, also, he was visited by astronomers, mathematicians, philosophers, theologians and princes, among the latter being the future James I of England, who took a lively interest in the astronomer's work. Asking Brahe what gift he should make in return for the other's courtesy, the scholar replied, «Some of your majesty's own verses.» So long as his munificent patron, Frederick II, lived, Brahe's position was all that he could have desired, but on his death in 1588 it was greatly changed. The petty prejudices of the nobles who felt that he had disgraced their order, and the jealousies of physicians, who were aggrieved because Brahe gave medicine gratis to the poor, tended to render his position insecure. Under Christian IV Brahe was barely tolerated; but in 1597 his situation had grown so unbearable that he left the country altogether, having been the year before deprived of his observatory and emoluments. After residing a short time at Rostock and at Wandsbeck, near Hamburg, he accepted an invitation of the Emperor Rudolph II — who conferred on him a pension of 3,000 ducats — to Benetek, a few miles from Prague, where a new Uraniborg was to have been erected for him, but he died shortly after. On his deathbed he solemnly confided his system to his celebrated pupil Kepler, then but 28 years old.

Brahe sought to combine the Copernican system with the old Ptolemaic system of the universe. The planets were considered as revolving round the sun, which with the stars revolved round the earth, the latter being fixed in space. Brahe rediscovered the variation and annual equation of the moon, first discovered by the Arabian Abul Wefa. His works include ‹Astronomiæ instauratæ Progymnasmata,› edited by Kepler (2 vols., Prague 1603); ‹Astronomiæ instauratæ Mechanica› (Wandsbeck 1598), containing an account of his life and discoveries and a description of his instruments. Complete editions of his works were issued at Prague in 1611 and Frankfort in 1648. Consult Bertrand, ‹Les Fondateurs de l'astronomie moderne› (Paris 1873); Bigourdan, ‹L'Astronomie; Evolution des Idés et des methodes› (Paris 1911); Brewster, ‹Martyrs of Science› (London 1841); Bryant, ‹History of Astronomy› (London 1907); Dreyer, ‹Picture of Scientific Life and Work of Tycho Brahe› (ib. 1890); Gassendi, ‹Vita T. Brahei› (Paris 1655); Lodge, ‹Pioneers of Science› (London 1904); ‹Tychonis Brahe Dani Opera Omnia› (tom. i, ed. by Dreyer, Copenhagen 1914).

BRAHILOW, BRAILOW, brä'ē-low, or **BRAILA,** brä'ē-la, Rumania, town and port on the left bank of the Danube. See BRAILA.

BRAHMA, the first person in the Triad, or Trimurti, of the Hindus, which consists of Brahma the creator; Vishnu the preserver or redeemer; and Siva the destroyer. He is represented with four heads and as many arms, holding in his four hands a manuscript book containing a portion of the Vedas, a pot for holding water, a rosary and a sacrificial spoon. The swan is consecrated to him and in the cave temple of Elephanta he is represented as sitting on a lotus, supported by five swans. He is the god of the fates, master of life and death, and, by some, has been represented as the supreme eternal power; but he is himself created and is merely the agent of Brahmă (a neuter noun), the universal power or ground of all existence. He is considered as the author of the Vedas and the lawgiver and teacher of India. The worship of Brahma is regarded as the oldest religious observance in that country. In modern Hindu religion, however, it has been practically superseded by the worship of Vishnu and Siva. The epithets applied to this divinity are very numerous, some of the most usual being Swayambhu, the self-existing; Parameshti, who abides in the most exalted place; Pitamaha, the great father; Prajâpati, the lord of creatures; Lokesa, the ruler of the world. See HINDUISM; INDIA.

BRAHMA FOWL, a popular meat bird, the result of a cross between the Gray Cochin or Shanghai, and the gray Chittagong. It has become established as a pure breed faithfully reproducing its own type. See POULTRY.

BRAHMACHARIN, «religious student,» the first of the four orders or stages of life through which the pious brahmin is directed to pass in order to attain immortality. See BRAHMIN.

BRAHMAGUPTA, Hindu astronomer and mathematician: b. Probably toward the close of the 6th century A.D. His ‹Brahmasphuta-siddhanta› (the Improved System of Brahma) is said to be an earlier work recast; portions of it have been translated into English.

BRAHMAKUNDA, or **PARASURAMKUNDA,** a famous gorge of Assam, in Lakhimpur district, through which the southernmost branch of the Brahmaputra flows. From time immemorial it has been held in reverence by the Hindus and although the journey to reach it is both difficult and dangerous, it is visited by thousands of devotees annually.

BRAHMANAS, the ancient theological writings appended to the original four Vedas by the Brahmans, or priests, for the purpose of very greatly magnifying their own office as a caste entrusted with the conduct of sacrifices of every kind. There are some 13 of them, with attachments to different parts of the original four Vedas. The Satapatha-Brahmana is the most important and valuable. It is called Satapatha, or «of the hundred paths,» because it consists of 100 lectures. It has a very minute and full account of sacrificial ceremonies in Vedic times, and many legends and historical allusions. Nothing could be more wearisome reading; yet the information which can be gleaned in regard to sacrifices, the priestly caste, and many features of the social and mental development of India, is very valuable. A devout belief in the efficacy of invocation and sacrifice appears in the Vedic hymns. This was taken advantage of by the Brahmans to arrange a regular use of these hymns in the two liturgical Vedas, and to establish a proper offering of sacrifices conducted by themselves. The Brahmanas are their endlessly repeated explanations and dictions about sacrifice and prayer.

The third, fourth and fifth books of the great work presented in these five volumes deal very particularly with the Soma-sacrifice, the most sacred of all the Vedic sacrificial rites. It concerns the nature and use of «a spirituous liquor extracted from a certain plant, described as growing on the mountains.» «The potent juice of the Soma plant, which endowed the feeble mortal with godlike powers and for a time freed him from earthly cares and troubles, seemed a veritable God — bestower of health, long life, and even immortality.» The moon was regarded as the celestial Soma, and source of the virtue of the plant. Another branch of the story of sacrifices relates to the worship of Agni, the Fire. It fills five out of 14 books, and the ideas reflected in it are very important for knowledge of Brahman theosophy and cosmogony. The ritual of the Fire-altar was brought into close connection with that of the Soma «fiery» liquor.

BRAHMAPUTRA, brä'ma-pö'tra, a large river of Asia, whose sources, not yet explored, are situated near Lake Manasarovara, in Tibet, near those of the Indus. In Tibet, where it is called the Sanpo, it flows eastward north of the Himalayas and, after taking a sharp bend and passing through these mountains, it emerges in the northeast of Assam as the Dihong; a little farther on it is joined by the Dibong and the Lohit, when the united stream takes the name of Brahmaputra, literally «the son of Brahma.» After entering Bengal it joins the Ganges at Goalanda and farther on the Meghna, and their united waters flow into the Bay of Bengal. The Brahmaputra is navigable by steamers for about 800 miles from the sea, its total length being, perhaps, 1,800 miles and its drainage area about 361,200 square miles. Through the last 60 miles of its course it is from four to five miles wide and studded with islands. Its waters are thick and dirty; its banks are mostly covered with marshes and jungles and are subject to annual inundations. During the season of the overflow, from the middle of June to the middle of September, the level districts of Assam are almost wholly submerged, so that travel is impossible except on causeways 8 or 10 feet high. The volume of water discharged by the river at such times is immense. Even in the dry season it is equal to 146,188 cubic feet a second, while in the same time and under the same circumstances the Ganges discharges only about 80,000. The river ranks next after the Ganges in commercial and agricultural value; large cargo steamers and a daily service of small passenger steamers ply on the Brahmaputra between Goalundo and Dibrugarh. The downward traffic consists mainly of tea, coal, timber, oil seeds, raw cotton, lac and hides from Assam; also jute, rice, tobacco and grain from eastern Bengal.

BRAHMIN, a term used to indicate the sacerdotal and, from an early period, the dominant caste of the Hindu community. The origin and rise of the Brahmin is shrouded in the mists of obscurity. Long before any period known to history the Brahmin was a power in Hindustan. The Brahmins, from an early period, left all wealth and temporal power in the hands of other castes. According to their Scriptures, the Brahmin is not allowed to own property, should not engage in trade or any other pursuit in life the object of which is to gain wealth; and the slightest infraction of the rules was visited with the direst of results. At one time, evidently, the Brahmins strictly followed the tenets as embodied in the Codes of *Manu* or the *Grihya Sutras.* The Brahmin's life is divided into four stages. At a tender age he becomes initiated by a ceremony known as *Upanayana,* after which he is to be a *Brahmacharin* or a student and seeker after knowledge. Next he marries and becomes a *Grihastha.* The third stage is called *Vanaprastha,* an intermediate stage between mixing in the world's affairs and complete renunciation. The fourth stage is one in which he becomes a *Sanyasin* and completely gives up the world and all mundane ties, devoting himself entirely to good deeds and contemplation of the divine. The whirligig of time has brought about radical changes in the Brahminical ideal, which has become impossible under modern conditions. The Brahmin, however, has remained the dominant caste for over 30 centuries. Even to-day, as Mr. Sherring says in his 'Hindu Castes and Tribes,' «Light of complexion, his forehead ample, his countenance of striking significance, his lips thin and mouth expressive, his eyes quick and sharp, his fingers long, his carriage noble and almost sublime, the true Brahmin, uncontaminated by European influence and manners, with his intense self-consciousness, with the proud conviction of superiority depicted in every muscle of his face, and manifest in every movement of his body, is a wonderful specimen of humanity walking on God's earth.» Whether he has lived his day remains to be seen. To-day he is the life and soul of every important movement in India.

BRAHMO-SOMAJ. See HINDUISM.

BRAHMS, Johannes, German composer: b. Hamburg, 7 May 1833; d. Vienna, 3 April 1897. His father was a double-bass player in the Stadt-Theatre of his native town and from him he received his first instruction in musical technique, but his artistic taste was developed under the guidance of the eminent musician, Eduard Marsden, of Altona. At the age of 14 years he made his first public appearance as a pianist at Hamburg, playing a set of variations composed by himself. In 1853 he traveled with the noted Hungarian violinist Remenyi on a concert tour of Germany as piano accompanist; this tour was critical for his whole career. In the program of the concert given at Göttingen was Beethoven's Kreutzer Sonata. The piano was a half tone below the true pitch, but Brahms straightway remedied the defect, playing the part from memory and transposing it from A to B-flat — a feat which won the admiration of the celebrated violinist Joachim, who was in the audience, and who after the performance made himself known to the young musician; thus commenced a warm friendship which lasted during Joachim's life. He gave the young man commendatory letters to Liszt, then at Weimar, and to Schumann at Düsseldorf, and advised him to give up the concert tour. Brahms acted instantly on this counsel, visited Schumann and showed him some of his compositions, with the result that Schumann recognized in the young artist supreme musical genius, and in his enthusiastic admiration hailed him in an article entitled «Neue Bahnen,» published in his *Neue Zeitung für Musik,* as already a master, the great composer of the future, and, in the words of John the Baptist (Matt. xi, 3) as rendered in the Latin vulgate, as «he that is to come.» Brahms, he declared, had not attained mastership by a gradual development, but had «burst upon us fully equipped as Minerva sprung from the head of Jupiter.» Yet at this time the young maestro had produced but very few works — a string quartet, a scherzo in E-flat and a few songs, among them the dramatic ‹Liebestreue.›

His eminent gifts were now generally recognized and, after giving a concert in Leipzig, two music publishers made an engagement with him to publish his compositions; and in 1854 he was appointed music master and choir conductor to the Prince of Lippe-Detmold. From 1858 to 1862 he resided first in Hamburg and then in Zürich, making musical tours and pursuing his musical studies. Going to Vienna in 1862, he was director of the Singakademie there in 1863, but after a few months resigned that office and quitted Vienna to resume his concert tours throughout Germany. He took up his residence again in the Austrian capital in 1872 and thereafter till his death Vienna was his home, though for some years he made musical tours occasionally; but toward the close of his life he devoted himself almost exclusively to the work of musical composition. In 1877 the English University of Cambridge apprised him of its senate's intention to honor him with the degree of doctor of music, but Brahms seems to have ignored the intended courtesy.

By his ‹German Requiem,› produced in the cathedral at Bremen in 1868, at a solemn religious function commemorative of the German soldiers who died in the war with Austria, he fully justified the prophetic utterance of Schumann and won for himself a place in the hearts of the whole German people. He called it the ‹German Requiem› to indicate the difference in tone and spirit between it and the traditional requiem, which echoes the doleful strains of the ‹Dies Iræ.› In the ‹German Requiem› buoyant hope and assurance of God's infinite mercy is the keynote. It is one of a class of sacred compositions, 12 in number, among them the ‹Triumphlied› (song of triumph), commemorating the German victories in the war with France in 1870–71, also some choral songs and motets. His other compositions, numbering about 150 pieces, are his secular choral works, among these Schiller's ‹Nänie› and the ‹Gesang der Parzen› (song of the Parcæ); concerted vocal works, among them the ‹Liebeslieder› (lays of love); orchestral works, among them four symphonies; chamber music; pianoforte solos; four books of Hungarian dances arranged for pianoforte duet. He never seems to have even attempted to compose an opera and confessed a distaste for that combination of music and drama. He seldom visited the theatre, and on the rare occasions on which he attended operatic performances he nearly always retired before the completion of the last act.

Brahms is ranked with the classic masters of music as the peer of Beethoven and Mendelssohn and inheritor of the traditions of the great school of the German composers. Temperamentally and in his mental habit he is essentially modern, original and spontaneous; he possesses the warmth of imagination and the quick emotionalism which are assumed to be characteristic of the romantic school, and to these he gives free play. But his creations are cast in the classic molds, or rather they appear to come to the birth naturally in classic forms; hence there is no shadow of incongruity between the matter and the form. Consult Deiters, translated by Newmarch, ‹Brahms: a Biographical Sketch› (1888); Dietrich and Widmann, translated by Heclet, ‹Recollections of Johannes Brahms› (1899); Erb, J., ‹Brahms› (London 1905); Fuller-Maitland, J., ‹Brahms› (ib. 1911); Imbert, H., ‹Johannes Brahms: sa vie et son œuvre› (Paris 1906); Kalbeck, ‹Johannes Brahms› (6 vols., Berlin 1904–13), the standard biography of Brahms; May, F., ‹The Life of Johannes Brahms› (London 1905); Perger, R., ‹Brahms› (Leipzig 1908); Reimann, H., ‹Johannes Brahms› (Berlin 1911); Thomas-San Galli, W., ‹Johannes Brahms› (Munich 1912); Widmann, J., ‹Johannes Brahms in Erinnerungen› (Berlin 1910). Consult also ‹Correspondence: Johannes Brahmes im Briefwechsel,› edited by M. Kalbeck and others (7 vols., Berlin 1906–12); Evans, E., ‹Historical, Descriptive and Analytical Account of the Entire Works of J. Brahms› (London 1912); Burkhardt, M., ‹Johannes Brahms: ein Führer durch seine Werke› (Berlin 1912); Hammermann, W., ‹Johannes Brahms als Liederkomponist› (Leipzig 1912); Knorr, J., and Reimann, H., ‹Johannes Brahms, Symphonien und andere Orchesterwerke erläutert› (Berlin 1908).

BRAIDED STREAM. A stream that is overloaded with sediment tends to deposit and choke up its own channel until the water is forced to break out and find a new course. If many such interlacing channels are formed the network is called a braided stream. The Platte affords a good example. Most streams flowing away from melting glaciers are braided. See also VALLEY TRAIN.

BRAILA, brä-ē'lä, **IBRAILA,** or **BRAILOW,** Rumania, town and chief port of Wallachia, on the left bank of the Danube, about 100 miles northeast of Bucharest and about 100 miles above Sulina at the river's mouth. Grain is the principal article of export and its industries include flour and rolling mills, cement, soap, rope and candle factories. Electric street railroads connect with the state-owned mineral springs and mud baths at Lacul Sarat (Salt Lake), annually visited by hundreds of health-seekers. Braila's history is largely that of Wallachia. It suffered severely from the Turkish wars in the 18th century, was taken by the Russians several times and finally burned down in 1770. Since the treaty of Adrianople in 1829 it has continued to form part of Wallachia but no longer a fortified town. Braila was taken by the German armies, under the command of General Mackensen in November 1916. The great stores of grain in the city and also in the city of Galatz, which had just been sold to England were added to the booty captured by the invader. Very many of the inhabitants had fled previous to the entrance of the Germans, saving what little they could of their belongings. Pop. 60,300.

BRAILLE, brä-ē, **Louis,** French educator of the blind: b. Coupvray 1806; d. 1852. He invented a system of writing with points, used extensively in institutions for the blind. Himself blind almost from birth, at the age of 10 years he was admitted to the Institute for the Blind in Paris, where he soon became proficient in both science and music. In instrumental music he attained a very high rank, becoming one of the most distinguished organists of Paris and also excelling as a violoncellist. At the age of 20 he had formed the idea of modifying M. Charles Barbier's system of writing with points so as to render it practicable and convenient, and not long afterward it was introduced into the Royal Institute, although no account of it was published till 10 years later. It was subsequently adopted in most of the continental schools and a little later in the United States, where it continues, with some modifications, in successful use. The signs of the original system are 43 in number, embracing the entire alphabet, all the diphthongs and marks of punctuation. Ten fundamental signs form the basis of all the rest. These signs, representing the first 10 letters of the alphabet and the 10 Arabic numerals, are as follows:

A	B	C	D	E	F	G	H	I	J
⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚
1	2	3	4	5	6	7	8	9	0

By placing one point under the left side of each fundamental sign, the second series is formed, comprising the next 10 letters. By placing two points under each fundamental sign, the third series, comprising U, V, X, Y, Z, C (C soft), É, À, É, U, is formed. By placing one point under the right side of the fundamental signs, the fourth series, embracing Â, Ê, Î, Ô, U, Ë, Ï, Ü, Œ, W, is formed. Three supplementary signs represent Ì, Æ and Ò. The marks of punctuation are the fundamental signs placed two lines below. The system has been applied to musical notation in such a manner as to make the reading and writing of music much easier for the blind than for those who see. The seven notes are represented by the last seven of the fundamental signs, and each of these notes may be written in seven different octaves by merely prefixing a sign peculiar to each octave, and thus the necessity of designating the key of each musical sentence in the ordinary way is avoided. The mode of writing is very simple. The apparatus consists of a board with a surface grooved horizontally and vertically by lines one-eighth of an inch apart. Over this board a frame is fitted like that of the common map delineator, and one or more sheets of paper being placed over the board, the points are made with a bodkin through a slip of perforated tin, ::, which contains all the changes used in the system. As the sheet must be reversed to be read, the writing should be from right to left, that it may be read from left to right. Of course, several copies may be made by one operation. For many years books have been printed in points in various countries. See Blind.

BRAIN, that portion of the nervous system contained, for the most part, within the skull. It is usually divided into two parts. The larger mass is termed the cerebrum, the smaller the cerebellum; from the lower end of the cerebrum the medulla oblongata tapers down into the spinal cord. The brain is, as it were, the great central station of the nervous system. From the surface of the entire body nerve fibres pass into the spinal cord, up the cord and into the brain; these carry impressions of all kinds — touch, taste, sight, hearing, pain, temperature, etc.— from the surface of the body, external as well as internal, to the brain. Starting in the brain mass itself, there is a corresponding series of fibres that run down into the medulla and spinal cord, out into the nerves and end in some muscle or organ of special character. There are literally millions of incoming fibres, millions of outgoing fibres and millions of minute cells in direct association with these fibres. Thus it may be seen that the brain is merely a collection of nerve ganglion cells and

HUMAN BRAIN (See Illustration).

FIG. 1.— HEAD AND NECK, SECTION FROM FRONT TO BACK.

1, Windpipe; 2, Larynx; 3, Spinal marrow; 4, Pharynx; 5, Tongue or Hyoid bone; 6, Epiglottis; 7, Tongue; 8, Hard palate; 9, Soft palate; 10, Bridge of the nose; 11, Frontal cavity; 12, Sphenoid cavity; 13, Nasal cavity; 14, Skin of the skull; 15, Bony skull; 16, Hypophysis; 17, Corpus callosum; 18, Septum lucidum; 19, Straight sinus; 20, Cerebellum; 21, Cerebrum, right hemisphere; 22, Lobes of the Medulla; 23, Pons Varolii; 24, Medulla Oblongata; 25, Zone of the Epistropheus; 26, Vertebrae; 27, Spinal continuation of the Vertebrae.

FIG. 2.— BRAIN, CROSS-SECTION FROM LEFT TO RIGHT.

1, Thalamus; 2, Skull; 3, Cerebral membrane; 4, Cerebral hemisphere; 5, Lateral ventricle; 6, Optic lobe; 7, Septum lucidum; 8, Longitudinal sinus; 9, Great longitudinal fissure; 10, Corpus callosum; 11, Median cerebral cavity; 12, Cerebral hemisphere; 13, Gray matter; 14, White matter; 15; Corpora Albicantia.

FIG. 3.— BRAIN VIEWED FROM ABOVE.

1, Occipital convolution; 2, Occipital lobe; 3, Inner parietal convolution; 4, Left cerebral hemisphere; 5, Inner frontal convolution; 6, Right cerebral hemisphere; 7, Frontal lobe; 8, Longitudinal fissure; 9, Median frontal convolution; 10, Occipital centre convolution; 11, Frontal centre convolution; 12, Outer frontal convolution; 13, Outer parietal convolution; 14, Median parietal convolution.

FIG. 4.— BASE OF THE BRAIN.

1, Eleventh or spinal accessory nerve; 2, Right hemisphere of cerebellum; 3, Twelfth or hypoglossal nerve; 4, Ninth or glosso-pharyngeal nerve; 5, Eighth or auditory nerve; 6, Seventh or facial nerve; 7, Medulla Oblongata; 8, Fifth or trigemenus (trifacial) nerve; 9, Central lobe; 10, Fourth or trochlear nerve; 11, Sixth or abduceus nerve; 12, Pons Varolii; 13, Right frontal lobe of the cerebrum; 14, Lobes of the medulla; 15, Optic chiasm; 16, Second or optic nerve; 17, Left frontal lobe; 18, First or olfactory nerve; 19, Sylvian fissure; 20, Third or oculo-motor nerve; 21, Tenth or pneumogastric nerve; 22, Left hemisphere of the Cerebellum.

HUMAN BRAIN

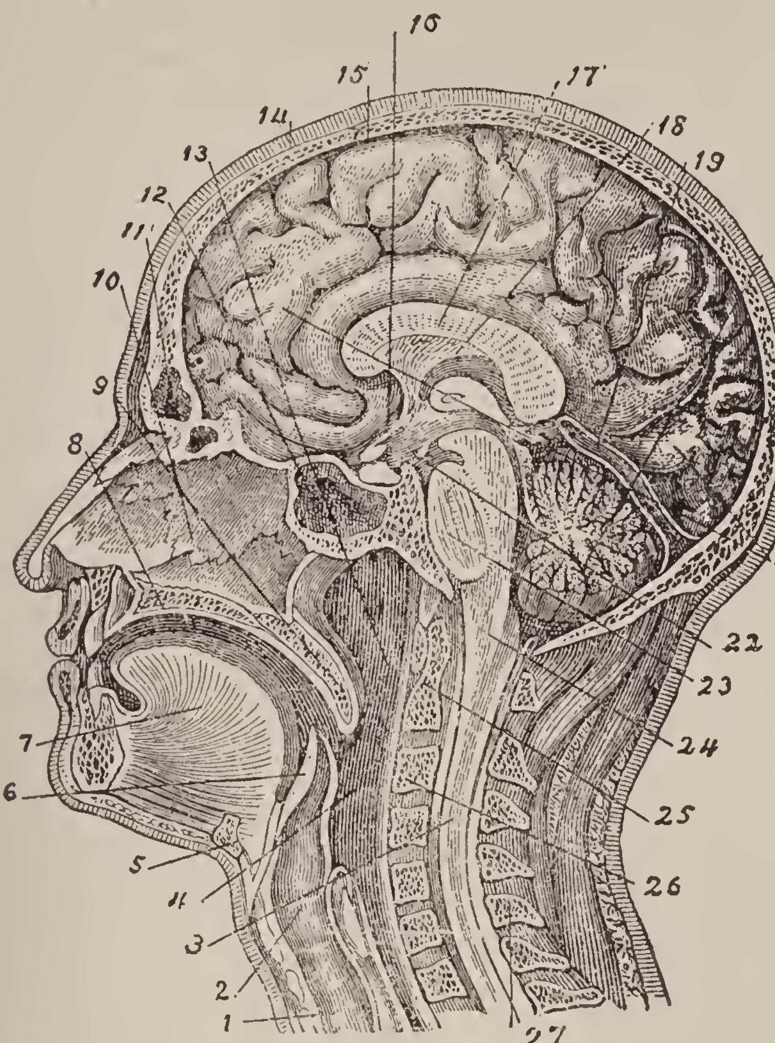


Fig. 1.

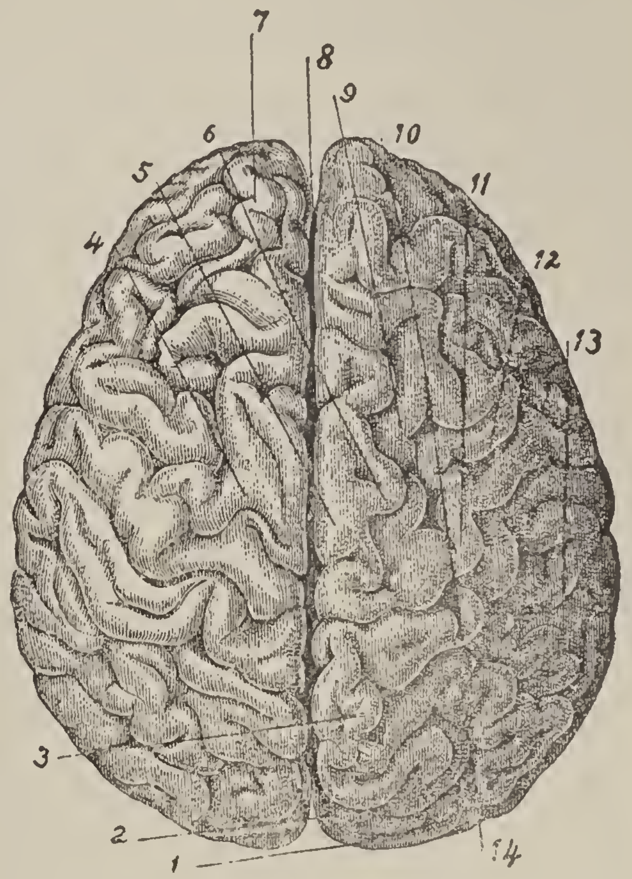


Fig. 3

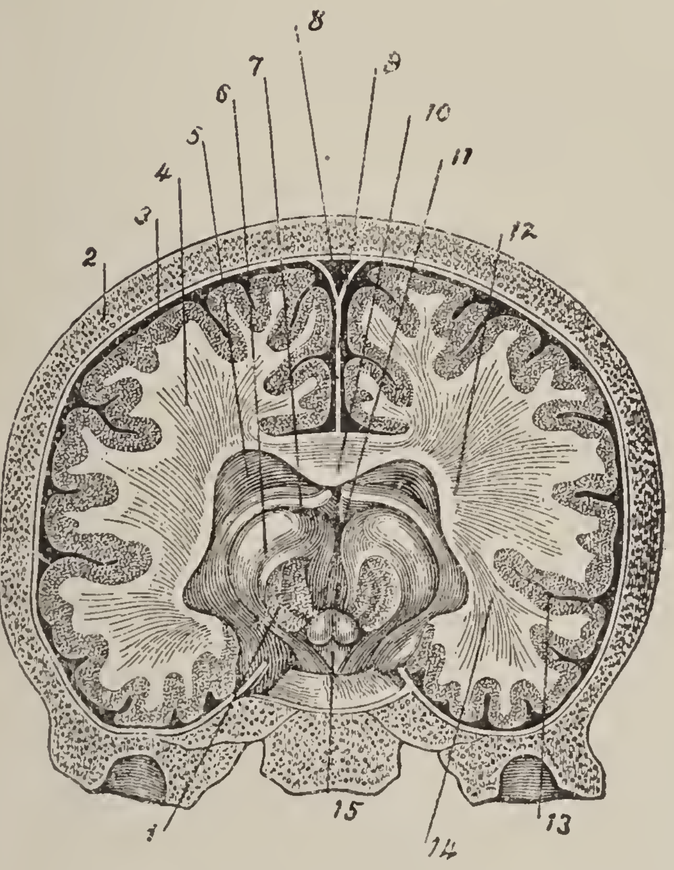


Fig. 2

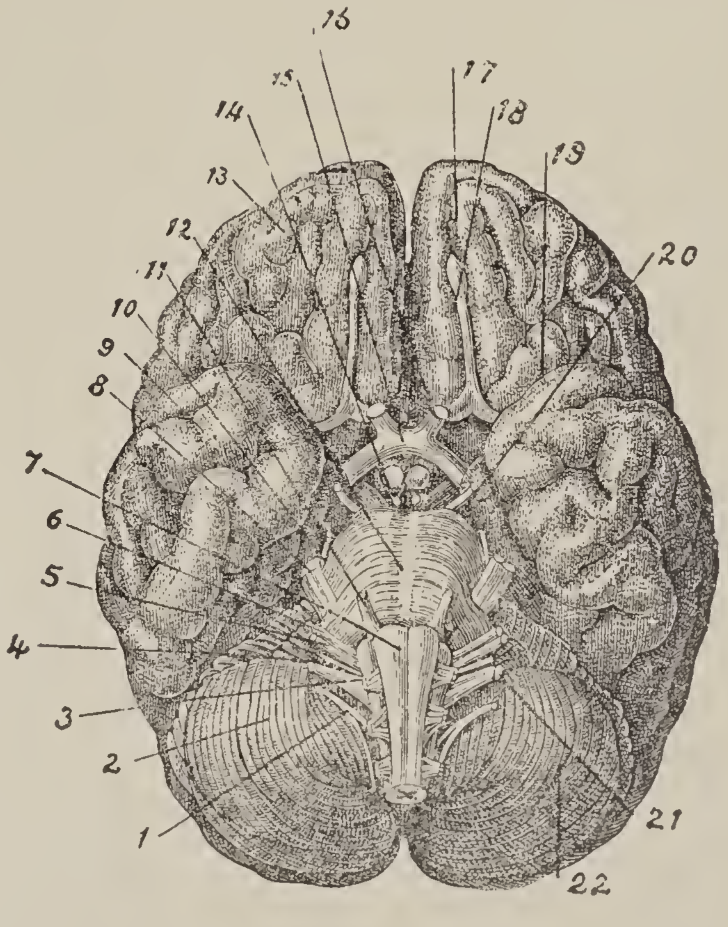


Fig. 4.

For explanation of figures, see article Brain

their associated fibres, both of which have a characteristic appearance as seen by the naked eye; that portion of the brain that preponderates in cells is the «gray matter» and that portion richer in fibres is the «white matter.» It thus represents a central switchboard, which binds all parts of the body together and puts the entire body in touch with its surroundings, that it may act as a distributor or transmitter of the vast sources of cosmic energy which is constantly beating upon the human body from the environment.

Cerebrum.— The larger brain mass, the cerebrum, consists of two symmetrical halves, the hemispheres, separated above by the great longitudinal fissure and held together at the botton of the fissure by a firm band of fibres, the callosum, and at the base by the cerebral peduncles, which unite below to form part of the pons, and the medulla. All of the fibres passing to and fro go up and down in the peduncles, separating into each hemisphere. The surface of the hemispheres is divided by fissures into several larger areas and a number of smaller ones. Thus in the lower side there is a large fissure, the fissure of Sylvius, below it there are three lobes, the first, second and third temporal lobes. Running from the great longitudinal fissure, making an angle of about 65° with the Sylvian fissure, the second most marked fissure, that of Rolando, is found. This divides off an anterior region in which the first, second and third frontal convolutions are to be found. Immediately around the fissure of Rolando are grouped the anterior and posterior parietal lobes, and at the back end of the hemispheres the occipital lobes are situated. All of these lobes are divided into smaller areas by the fissures, the chief end subserved by these fissures being to increase the amount of outside surface of the hemispheres and thus make room for the enormous number of cells that are located in this outermost gray layer, the cortex. A further function seems to be expressed by this division into lobes and convolutions, namely, a localization of function, a concentration of energy as it were, certain types of brain activity being relegated to certain brain areas. Thus it is assumed that the main function of the frontal lobes is largely that of the reasoning faculties and higher intellectual processes. It is very well established that the cells in the cortex that are grouped up and down both sides of the fissure of Rolando are the cells that govern the motor acts of the body; irritate these, and muscular convulsions in certain groups will occur; destroy them by accident or disease, and paralysis, or loss of muscular function, will result. The localization for certain muscle groups, such as those for the head, arm, eyes, leg, etc., are very well known. In the occipital lobes, particularly in certain areas about the angular gyrus, are the centres for sight memories. Their destruction may result in mind blindness (see Aphasia). In much the same manner the memories of sound are located in the temporal convolutions, and there are a large number of areas thus localized. These different areas are all brought into connection, the one with the other, by hosts of fibres, and as already indicated the two hemispheres of the cerebrum are connected by millions of fibres that are in the callosum. Thus in the adult normal cerebrum all parts of the cortex are brought into close connection with one another and with the other half of the cerebrum; the connections with the cerebellum and with the cord are established as well. The richness of association is an index of the education and intelligence of the individual. These cortical connections are not a helter-skelter, hit-or-miss system, they are all carefully laid down, constituting the human brain one of the most remarkable «switchboards» ever made. Modern anatomy is busy unraveling all the fibre and bundles of fibre tracts, and it will not be many years before the map of the brain will be as well known as that of New York. When that time arrives there will be clearer knowledge of the mechanism through which normal effectual adaptation to the external world is attained. Such light is already shining more fully upon these and the darker problems of failure in adaptation through psychical misdirection of the brain mechanism or organic lesion of the machine which prevents adequate psychical expression.

In addition to the cortical ganglionic masses of cells, there are a number of similar masses of cells located within the substance of the brain mass. These are subsidiary stations, as it were, for many of the fibre tracts going to and coming from the cortex. These are the caudate and lenticular nuclei, the optic-thalamus, and a number of smaller ones.

Cerebellum.— The cerebellum, or little brain is situated behind and almost beneath the cerebrum, which partly overlaps it. It is attached to the brain stem by penduncles and its connections with the cerebral centres and those of the cord are many and complex. In minute structure the cerebellum has a number of characteristic features by which it may be recognized under the microscope, but fundamentally the nerve cells are similar, the interstitial connective tissue is the same in kind as in the cerebrum and the blood vessels, veins and lymphatics have similar properties. The chief function of the cerebellum is that of adaptation to space relations.

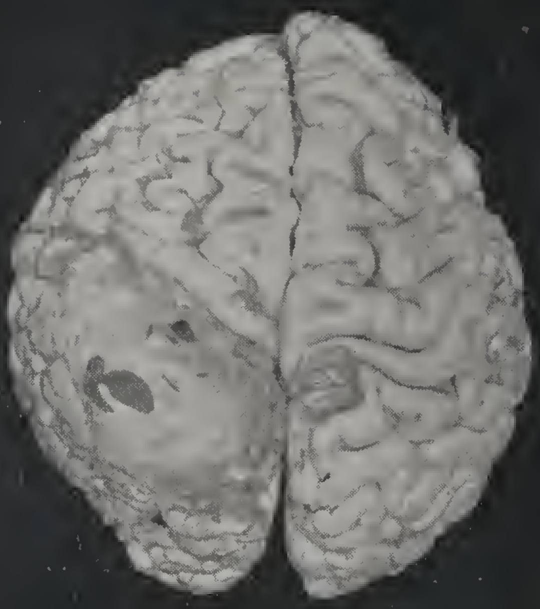
Membranes.— Surrounding the entire brain mass and extending down over the spinal cord there are three coverings. These are an outside strong and thick dura mater, and two inside delicate membranes, the arachnoid and pia mater.

Cavities.— The brain is not a solid organ. It is really a flattened-out expansion of nervous tissue peculiarly grouped about a central cavity. This central cavity at one time was as simple almost as the space occupied by the graphite in a lead pencil, but in the adult brain there are lateral ventricles, third and fourth ventricles, all of which are too complicated to be described here. The ventricles contain a fluid, the cerebrospinal fluid, which also bathes the outside of the brain. The cavities of the brain are continuous with the central cavity of the spinal cord.

This modern conception of the brain as a complicated automatic switchboard may be elaborated to any amount of detail. If one should trace, however, the path of a single impulse from the outside world, be it one of sight, smell, taste, touch, pain, etc., one would trace it, say for pain — first from the point of contact, for instance, of the finger, whence the special nerves of sense would carry it to the spinal cord; here it travels up definite tracts in the cord (for the upward paths for the passages of sensations and the downward ones of messages to act are as definitely known as are the railroads from New York to Chicago); from the cord it passes into the medulla, still in a well-defined path, where only it and its kind travel (about here the fibre tract crosses to the opposite side of the medulla); then through the pons, through the cerebral peduncles, up to the secondary centres, to the cerebellum and the sensory area in the cortex, which is supposed to be situated just behind the motor area. As soon as the sensory impulse reaches the cortex it is felt as pain and referred to the spot in the skin in contact with the irritant. Immediately on the perception of pain, so intimate are the connections of the sensory areas with the motor areas from these motor cells, a conscious impulse is flashed down another series of fibres, down the peduncles to the medulla (where the fibres also mostly cross to the opposite side), down the spinal cord, out on a motor nerve to the muscle to cause a muscular act of pulling the hand away from the harmful irritant. This is the long, conscious series. There may also have been a shorter reflex cycle whereby the impulse passed to the spinal cord and an immediate motor connection was made that caused a quick jerking away of the hand, even before the perception of the sensation had taken place. This is the reflex cycle. See REFLEX ACTION.

The study of the comparative anatomy and physiology of the nervous system is one of the most enchanting departments of human knowledge. To trace the gradual development of this intricate and marvelously adjusted regulator of the entire body, from its simplest terms of "protoplasm irritability" through the isolated ganglionic masses in such animals as the starfish, the gradual chaining of one mass to another as in the worms and insects, thus bringing a certain relation of one part to another, up to the fusion of different ganglionic masses to form a chief mass, the brain, and secondary masses, the spinal cord — this is a story of so many chapters and volumes that it cannot even be sketched here; but it is very certain that the gradual evolution of the nervous system shows the extreme complexity of man's activities. Although throughout the entire series, nerve cells are alike, it is only in the great multiplicity of co-ordinations and connections that man's brain differs from the nervous system of a jellyfish or a worm. It is only in the animal series beginning with *Amphioxus* that a distinct brain mass commences to be seen. But from this point forward the modification in form, size and complexity is gradual. While man has the most complex brain, he has not the heaviest brain, although in comparison with his size it is the heaviest. The brain of man is usually heavier than that of woman, although at birth and at the age of 14 the female brain is heavier. The average weight of the male brain is about 48 oz., of the female 43½ oz. Taller and heavier persons have usually heavier brains. Weight of brain, however, has no direct relationship with intelligence, as idiots' brains are known that have weighed as much as those of many of the ablest of men. Intellectual capacity, as already said, consists in the great multiplicity of nerve cell connections. In which connection it might also be added that the shape and size of the outside skull bears no constant relation to the shape and size of the inside brain. Cuvier's brain weighed 64½ ounces. Gambetta's only 39 ounces. While it is true that a number of celebrated men of recognized brain power have had large brains, there are many more of equal capacity whose brain weights have not been remarkable. (See NERVOUS SYSTEM; SPEECH CENTRES). Consult Barker, 'The Nervous System'; Dejerine, 'Anatomy of the Nervous System' (French); Herrick, 'The Nervous System' (1916); Jelliffe and White, 'Diseases of the Nervous System' (1917). SMITH ELY JELLIFFE.

BRAIN, Diseases of. These are so many and so diverse that a general article cannot readily be written upon them. In general they may be divided into: (1) Developmental defects. These are considered under idiocy, imbecility (qq.v.), etc. (2) Acute infections in which the brain itself or its surrounding membranes are attacked by some form of bacterium, such as influenza bacillus, the pneumococcus, that ordinarily is the main cause of pneumonia, the typhoid organism, or certain forms of cocci. These diseases are discussed under the heads, encephalitis, meningitis, cerebral abscess, epidemic cerebro-spinal meningitis (qq.v.). (3) Acute and chronic poisoning, including delirium tremens in alcoholism (q.v.), toxic manias, etc. (4) Diseases of the blood vessels of the brain. The condition generally known as apoplexy arises from disease of the cerebral vessels. This manifests itself in three different forms due to cerebral hæmorrhage, cerebral thrombosis or cerebral embolism. These are discussed here. In all, the symptoms are much alike, as similar areas in the brain may be affected by each. In hæmorrhage there is a bursting of one of the cerebral blood vessels, with pouring out of blood into adjacent brain tissue and destruction. A certain blocking of the artery also results. In thrombosis, the walls are diseased and a soft mass collects on the inside of the blood vessel in the brain and blocks it up. This shuts off the circulation in a certain area supplied by the artery and there is degeneration in that area with softening perhaps and cyst formation. In embolism some foreign body from some other part of the arterial system is swept into a blood vessel of the brain and blocks it up. In all three forms of apoplexy the attack may be very slight, if the cause is slight, a temporary loss of consciousness, or a paralysis in one limb, or a hemiplegia that is transitory — these may be all that is noted. But the usual attack of apoplexy is much more severe. The patient is rendered unconscious, the face is purple or congested, there may be voiding of urine and feces, the breathing is slow and snoring in character, the pulse is usually slowed to 50, and often soft and full; nausea and vomiting and lowered temperature may also occur. The pupils may be dilated and the eyes may appear crossed. There is usually noted a difference in the two sides of the face, one side of the body is different from the other, and on lifting the limbs there is a change in their resistance. The patient may remain in this condition and die



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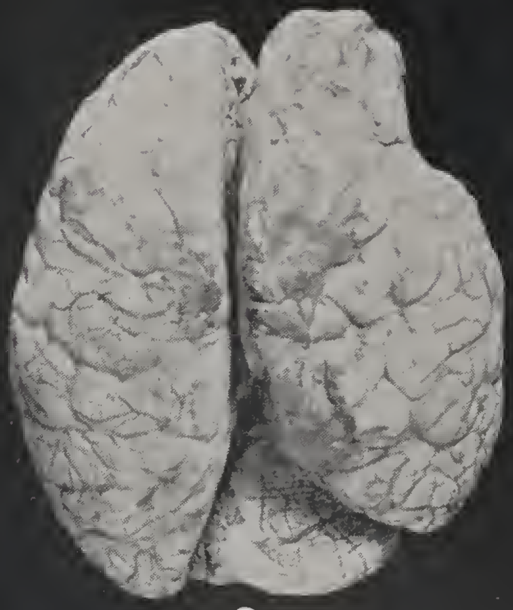

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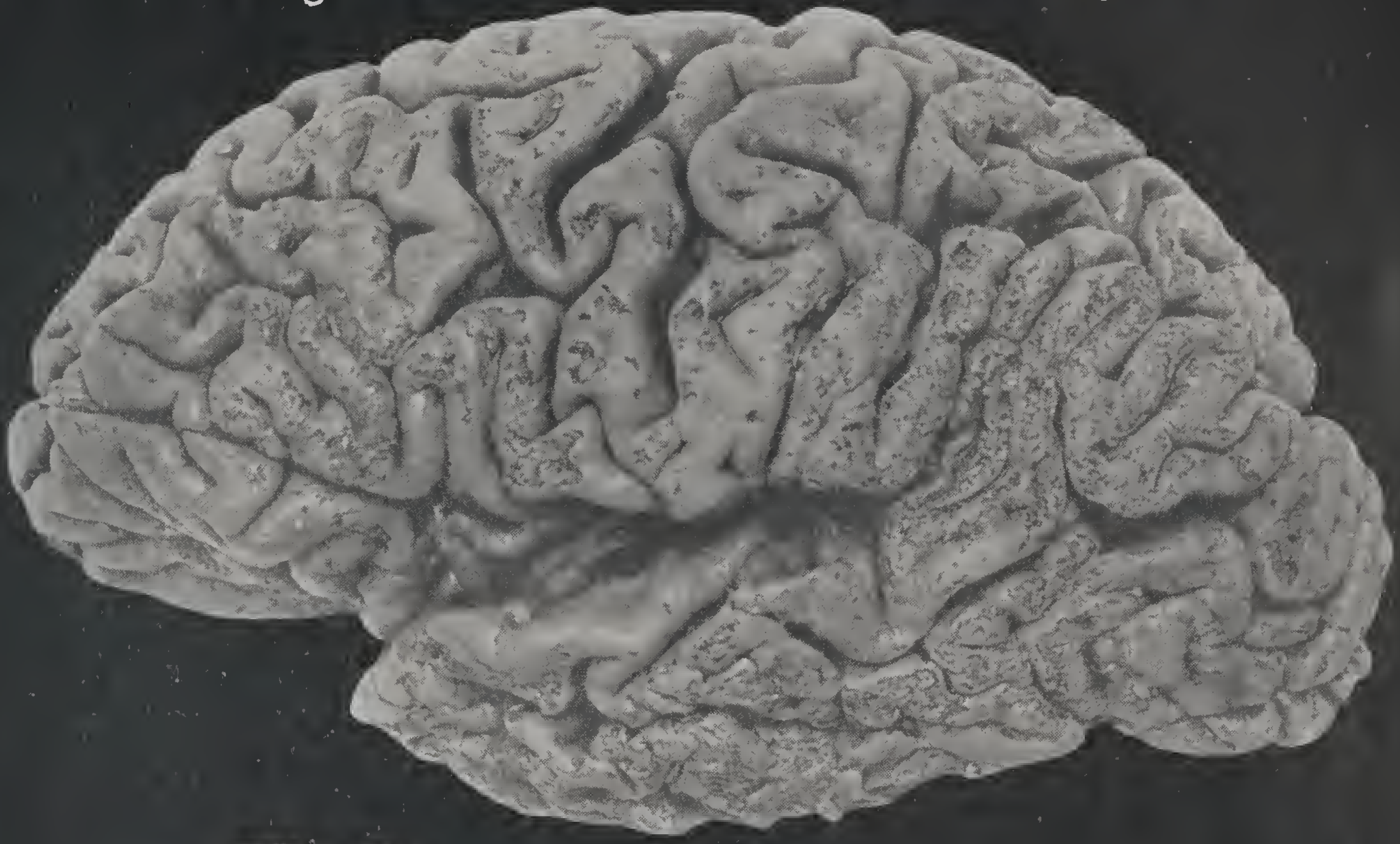

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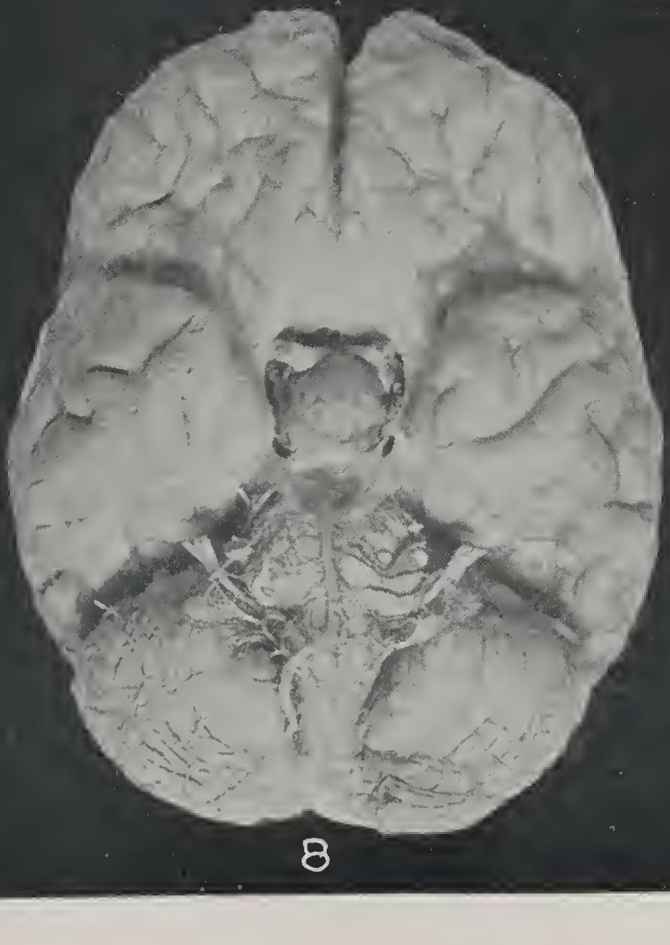

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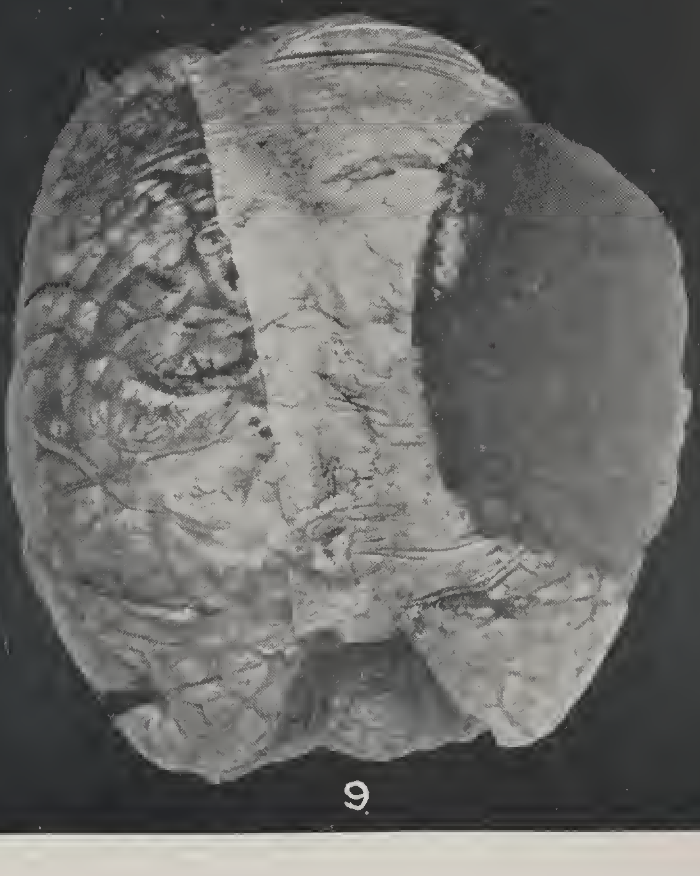

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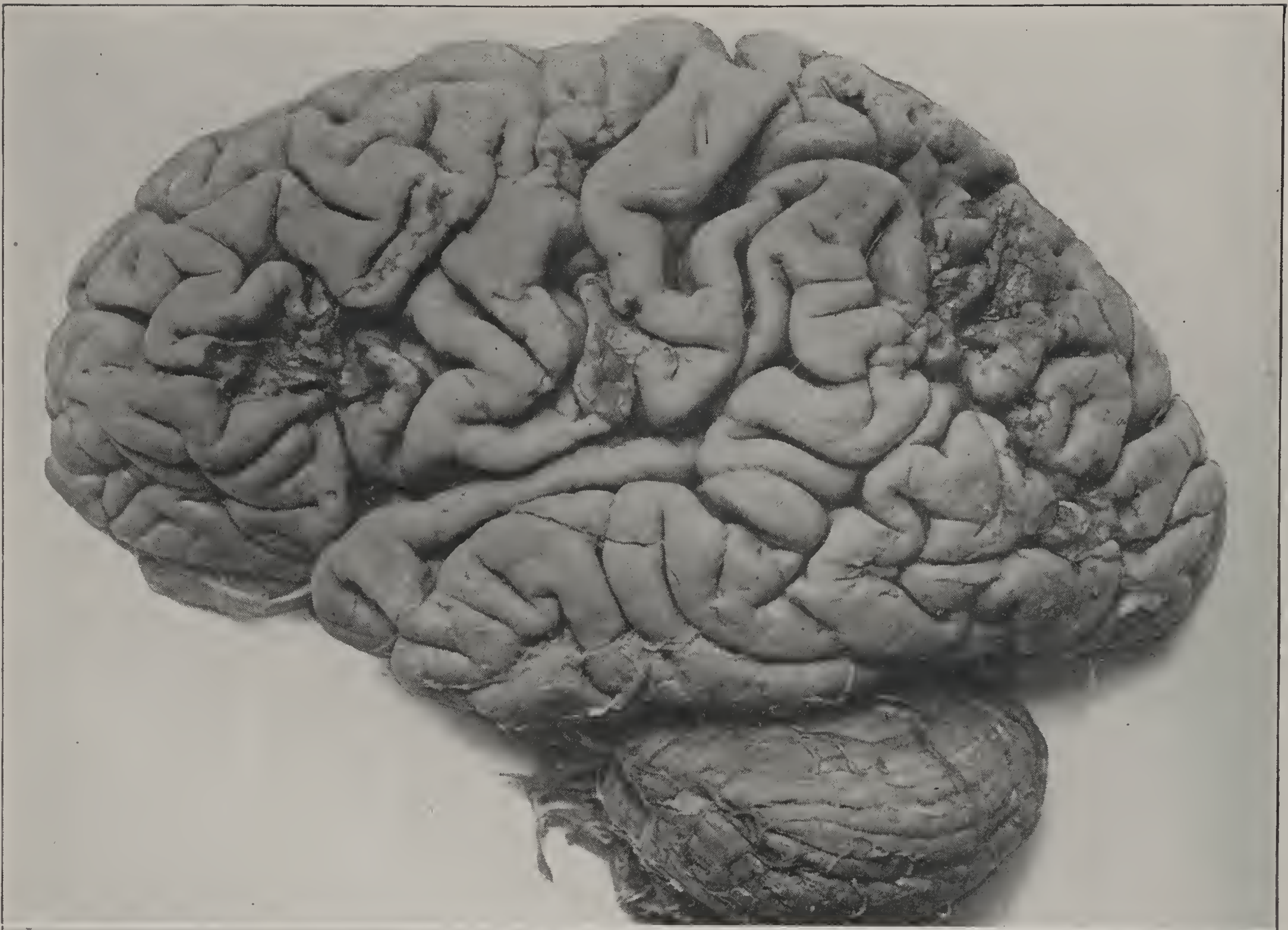
Fig. 5. Cyst of Brain following Abscess
Fig. 6. Brain Atrophy due to Encephalitis and resulting in epileptic convulsions and imbecility
Fig. 7. The Brain of a Paretic showing the destructive changes in the brain cortex of syphilitic origin
Fig. 8. Cyst of the Hypophysis or Pituitary — Patient showed blindness and obesity
Fig. 9. Hemorrhage of the Brain Meninges due to a blow on the head



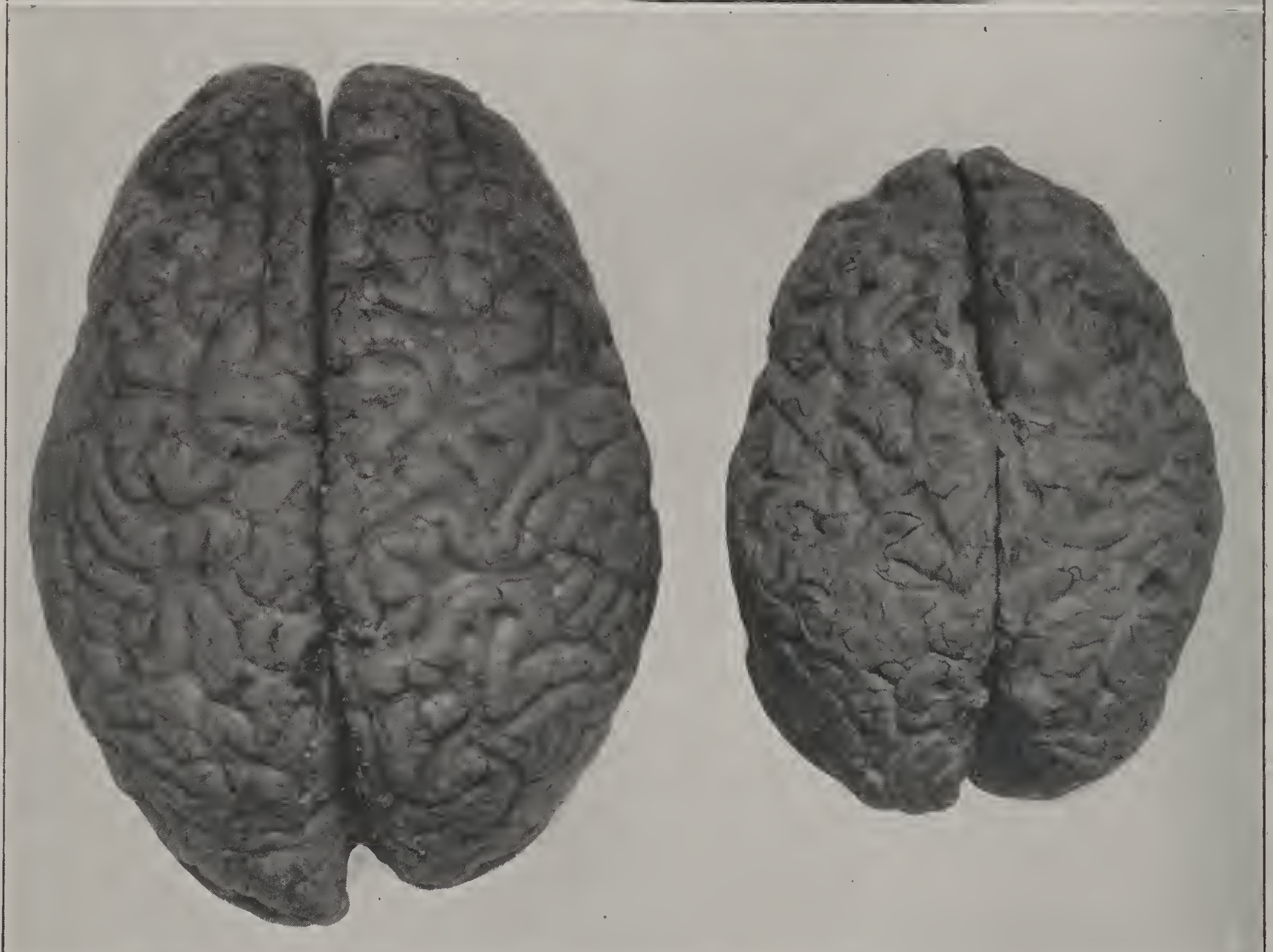


Fig. 3. Syphilitic Disease of the Cortex of the Brain Causing Epileptic Convulsions. One of many causes for such convulsions (Jelliffe and White)

Fig. 4. Brain of Healthy Individual (left) and Brain of Idiotic Child (right). The latter due to congenital syphilis of the brain (Jelliffe and White)

very soon, or he may have a rising temperature for a week and then die, or he may recover consciousness to find that one entire side of his body is paralyzed, or incapable of being moved by the wish. If the right side is involved the patient usually has defects in his speech (aphasia, q.v.). After a few days, this paralysis may pass away, but it usually persists for life in some form or other. Almost invariably the paralyzed limbs improve greatly; at first the leg and later the arm, and the improvement may be very great so that only a slight trace of what was a disabling affliction remains. The shades and variations in symptoms and in the outcome are numberless. The treatment of an attack of apoplexy requires prompt attention. Heat to the extremities, mustard bath to the feet, absolute quiet, removal of constricting bands about the neck, placing the patient on the non-paralyzed side, in many cases blood-letting; these are the generally recognized things to do. The outlook is always serious. Hæmorrhage is apt to occur in those over 50, thrombosis is those affected with syphilis, and may occur at any age, embolism usually accompanies some infectious disease, such as pneumonia, rheumatism, scarlet fever, childbirth fever, etc., and may affect old or young. (See DIPLEGIA; HEMIPLEGIA; MONOPLEGIA). (5) Accident or injury to the brain. These may occasion various forms of hemiplegia; diplegia, particularly in the injuries of childbirth; epilepsy, etc. (6) Tumors of the brain. (See BRAIN, TUMORS OF THE). (7) Organic disease of the brain functions. This gives rise to various forms of psychoses. Softening of the brain is a term denoting either a dementia (q.v.) of old age, or the progressive dementia known as general paresis (q.v.). The insanities in their various forms and phases are treated in their appropriate relations under one inclusive head. (See INSANITY). Consult Jelliffe and White, 'Diseases of the Nervous System' (1917).

SMITH ELY JELLIFFE.

BRAIN, Syphilis of the. The subject of brain syphilis is a broad one, and furthermore it is one that escapes all attempts at narrow descriptive control. Of all brain conditions it is the one most frequently seen by physicians and leads to the most disastrous results. The World War will bring about widely extended infections among the soldiers and brain syphilis will be greatly on the increase by reason of its ravages, which will be as severe as the actual wounds of war. The underlying pathological processes are either meningeal, arterial or infiltrative, that is gummatous, and these processes may either exist alone or in various combinations, so that an extremely variable, complex and confusing series of clinical syndromes may arise, depending upon the interrelationship of the pathological trends and the anatomical paths or centres implicated or destroyed.

So far as the therapy of syphilis of the brain is concerned, these confusing clinical pictures are fortunately of minor interest. Yet, it is desirable to obtain as clear a clinical grasp of a cerebral syphilis as possible, for such an insight is often extremely valuable from the standpoint of therapy.

Following a classification which the writer has followed in 'Diseases of the Nervous System' (2d ed., 1917), the subject will be discussed here under the following clinical forms: (1) Syphilis of the cranial bones; (2) syphilis of the basal meninges; (3) syphilis of the convexity; (4) cerebral syphilis, arterial types; (5) meningoencephalitis, paretic and taboparetic types; (6) syphilitic psychoses; (7) hereditary syphilis of the brain.

In a discussion of syphilis of the nervous system, the forms of syphilis of the spinal cord which accompany that of the brain might properly be included, but are excluded from this article by reason of its title.

1. Syphilis of the Cranial Bones.— Only those which cause symptoms of brain involvement are mentioned here. In the works of the early clinicians of the middle of the 16th century, syphilis of the cranial bones was very frequently described, and it would seem that throughout the 16th, 17th and 18th centuries brain involvement through extension of gummata of the dura and of the bones was more frequent than at the present time. This diminution in cases observed is probably due to the better treatment to which syphilis is now subjected.

In discussing syphilis of the bones of the skull, gummata are practically the only pathological forms of interest. They are usually circumscribed and, when large enough to cause symptoms, give rise to the picture of a tumor of the brain (q.v.). The exact trend of symptoms depends largely upon the location. Not infrequently they give rise to epileptiform convulsions. When impinging upon the motor areas they have been known to give rise to various forms of monoplegia, hemiplegia, aphasia, or even sensory eye signs. The gummata of the frontal region which protrude into the frontal lobes may give rise to a psychotic picture, at times accompanied by «Witzelsucht.»

The general symptoms of brain tumor, such as headache, nausea, vomiting, sleeplessness and choked disc are to be expected. In autopsy records one is struck with the frequency with which these cases are treated as epileptics. Not infrequently cranial bone gummata involve the base with caries, the upper vertebræ often affording complications. Here stiffness and rigidity of the neck are not infrequent signs.

It is important to bear in mind that many of these gummata are best attacked by surgical means. It is futile to attempt to get rid of them by antisyphilitic measures, especially when they are large and dense.

2. Syphilitic Meningitis of the Base.— This is a very frequent form of cerebral syphilis. The optic chiasm is involved quite often in the very early stages of the meningitis. Spreading in all directions from here, the thickening of the meninges and the infiltration of the gummatous growth brings about a very complicated symptomatology. The gummatous masses invade the brain structure, grow about the emerging and entering cranial nerves, and may even involve the bones of the base and the upper cervical vertebræ. The diffuse type making up a gummatous meningoencephalitis is most frequent, but at times a syphilis of the base will consist of an isolated vascular disease, or of circumscribed gummata, or possibly even simpler manifestations of the disease, giving rise to very simple pictures, such as a primary optic neuritis, or paralysis of a single cranial nerve, or a mild headache and rigidity of the neck.

The general picture, however, is apt to be more complex. In its initial phases headache, increasing stupidity, increasing emotional apathy, forgetfulness, negligence of personal appearance or business engagements create the impression that a paretic process is in course of development, but as the infiltrating or gummatous growths increase the cranial nerves are involved, thus introducing certain variants which permit a diagnosis. Headache is a frequent sign, is often boring or stabbing in nature, the head showing tenderness on percussion, especially over the occiput. Optic nerve changes develop in from 20 to 40 per cent of the cases, one eye or the other showing choked disc or atrophy. The sixth nerve is mostly frequently involved. As it has a long pathway on the base of the skull it is most likely to be caught in the gummatous infiltration. Internal squinting is thus a frequent sign. The third nerve in some of its branches is also often implicated. Ptosis in one eye develops early, then rectus palsies follow, one pupil commences to dilate, or becomes irregular, then loss of pupillary reflex shows with final development of an Argyll-Robertson syndrome. This is apt to be incomplete, and not as in those forms of cerebral syphilis of a more ideal paretic, or taboparetic nature.

Painful flashes in the side of the face, changes in sensibility, point to implication of the trigeminus; facial palsy may result in others. The IX, X, XI and XII nerves may be caught in the syphilitic exudate, with changes in the respiration, irregular heart action, hemiatrophy of the tongue, etc., as their characteristic symptoms. The mental picture, as already outlined, is striking. There is a half dull, apathetic psychosis that not infrequently suddenly gets worse, with coma or unconsciousness, with periods of acute confusion, possibly of violent delirium. The marked variability in the dullness, apathy or coma is very characteristic of basal syphilis. Certain patients show a mild delirium, others are fairly violent, resembling an acute attack of meningitis, or a manic depressive psychosis. Many of these cases suddenly clear up, apparently from no reason whatever. This is a not infrequent situation in these basal syphilitic cases. At times the patients show depressed phases, again they are confused; still others would pass for dements, while others again would be diagnosed as manic depressives. A few show persecutory notions, and in the language of the descriptive psychiatry of 10 or 15 years ago these would be called by the names already indicated. Present day psychiatry regards them solely as kaleidoscopic mental picture variations of one disease, namely, syphilis. This point of view has come about through careful studies, and through the gradual extension of knowledge of the cytology and serology of the blood and cerebrospinal fluid. Naturally this point of view aids to a much more enlightened therapy, for one does not attempt a treatment of mania, or dementia, or melancholia which are names solely, when after all one should treat syphilis which is a definite affair.

3. Syphilitic Meningitis of the Convexity.—It is largely because of variations in the trend of the symptoms, rather than from any fundamental pathological difference that this subdivision is made. In many individuals syphilitic meningitis of the base is accompanied by one of the convexity as well, and practically all cases of syphilitic convexity meningitis show some signs of syphilis elsewhere. The only question here is of a greater predominance of localization of pathological processes in the convexity rather than in the base.

4. Cerebral Syphilis, Arterial Types.—Here one distinguishes two very pronounced types, although intermediate forms are the rule. One speaks of (*a*) cerebral syphilis of the smaller vessels, Heubner type, or (*b*) cerebral syphilis involving the larger vessels with embolism, thrombosis, or even hæmorrhage, giving rise to the classical hemiplegias. In the former type, that of cerebral syphilis of the smaller vessels, one has presented the classical picture, in the mild grades, of persistent headaches with slight mental changes; in the severer grades, the picture of a general paresis. The patients show various forms of acute convulsive attacks, comatose periods due to softenings in this or that portion of the cerebral cortex, the picture often resembling that of a pronounced senile dementia or a pronounced paresis, with aphasia, word blindness, astereognosis, monoplegias, etc.

There is a great multiplicity in the syndromes present in cerebral syphilis of this type. One characteristic feature is that of the remissions, which are also so frequent in paresis.

In cerebral syphilis of the larger vessels, the characteristic apoplectiform results that mark hemiplegias or hemianæsthesias, thalamic syndromes are found.

All of these forms of syphilis are characterized by local minor injuries.

Headache is usually present, often paroxysmal, at times migrainous in character, frequently increasing in nocturnal severity. Local pains on percussion, and tenderness are frequently found. Symptoms of general brain pressure are apt to be less here than in basal meningitis, but there may be nausea, vomiting and giddiness. The optic nerve changes are less liable to be found. Epileptiform convulsions are not infrequent, and simply indicate the localization of the process. When the attacks are Jacksonian in type, the presence of an isolated gumma may be suspected. Aphasic attacks, especially of motor aphasia of the Broca variety, are also to be reckoned among the isolated symptoms, and speech difficulties which do not develop into true aphasias are not infrequent. Monoplegias or hemiplegias may develop, with or without sensory disturbances, hemianæsthesia, astereognosis, etc.

When the layers of the cortex are involved as well as the meninges, one sees the gradual development of a mental picture closely resembling that of paresis, in fact, in a certain percentage of cases a clinical differentiation is impossible. Here one finds a slowly increasing apathy, forgetfulness, indifference and all the signs characteristic of general paresis (q.v.). The application of Nonne's four reaction tests gives valuable insight into the process more or less by the comparatively rapid appearance of the symptoms following infection. Basal syphilis, convexity syphilis, syphilis of the small arteries or hemiplegic syndromes, due to involvement of the larger vessels, thrombosis, etc., may come on as early as from three to six months after an initial infection. The average time, however, varies from one to three years, the maximum possibly expressing itself about the third year, whereas, as is well known from the studies of Fournier, Kraepelin, Junius, Arndt and others, paresis is apt to come on much later, the maximum paretic development showing about the 10th year. Still, cerebral syphilis, in certain of the forms here described, may occur many years after infection, certain cases being reported as late as 40 years after infection. This, however, is a marked exception.

Treatment.— The treatment of these forms may be discussed in one paragraph, as the objects are practically the same, namely, to kill the syphilis organism as rapidly as possible, and to reduce the effects of the pressure symptoms due to the gummatous or inflammatory exudates. This is not the place to discuss prevention. Individual prophylaxis also is out of place here. The treatment is very satisfactory, especially if the diagnosis is made early, and the patient has never received much treatment, but in old long-standing cases, which have been much treated, and yet seem to progress in spite of treatment, the outlook is not very hopeful. This latter result is often due, we feel, to insufficient and half-hearted therapy. Cerebral syphilis is usually accompanied by spirochetes, and the object is to poison them as rapidly as possible. This can be done by arsenic, by mercury and by the iodides, but these remedies have a very definite variation in their spirochetal toxic properties. Arsenic is the most active, mercury next, while the toxic action of the iodides, although positive, is very slight. The treatment of cerebral syphilis should be most energetic, because small lesions may involve very important areas and result in great deprivation to the patient. The nervous and mental structures are of the greatest importance to the individual in his struggle for existence, therefore, syphilis of the brain is always an extremely dangerous disease. A complete sterilization is desirable, but this is often difficult to bring about, especially in nervous tissues, for reasons as yet not completely understood.

Space is not available for a complete discussion of the treatment of cerebral syphilis, but it would seem that the trend of modern opinion is to attack it very actively.

Combined salvarsan and mercury treatment has seemed to give the best results. The patient should be given a dose of calomel by injection on the 1st day, to be followed by a similar dose on the 3d day. On the 5th day he should be given 0.6 gram of salvarsan or neosalvarsan by the intravenous method. The 7th and 9th days, intramuscular injections of calomel, the 11th day another dose of salvarsan, the 13th and 15th days, two injections of calomel, the 17th another of salvarsan, and this should be continued for at least six weeks, unless specific indications of mercurial poisoning arise which render it necessary to cut down the amount of calomel. In this case a less active form of mercury can be given, such as salicylate or cyanide, but at least five grams of salvarsan should be used in the therapy. To give one, or two, or three doses of salvarsan invites failure, and, we are tempted to believe from more recent studies, tends to permit the development of the more feared metasyphilitic processes of paresis and taboparesis. This is an outline of an energetic antisyphilitic therapy.

For years it has been the custom to praise the use of mercurial inunctions in the treatment of cerebral syphilis, and clinical experience seems to show that they are of much value, but similar experience seems also to indicate that thus far the inunction treatment has not been sufficiently prophylactic with reference to the more severe forms of cerebral syphilis. It is hoped that the combined method of mercury and salvarsan will provide this prophylaxis. Mercurial injections may be substituted for the combined method, or for the method of inunction, but these do not seem to be as radical as the method already outlined. In the later stages of the treatment, daily doses of from 30 to 40 grains of potassium iodide may be given for from four to six weeks.

After such a complete «cure» has been instituted, the patient should be allowed to rest untreated for about three or four months. A Wassermann should be then taken and a cerebrospinal-fluid examination made and if the biological and cytological reactions indicate that the spirochetes are still active, or have renewed their activity, the patient should be put through a similar cure. This can be repeated again after an interval of five or six months. Ideally, one can check the effect of the treatment by reason of the Wassermann reaction; practically, however, this seems to be unnecessary, if not utopian.

5. Cerebral Syphilis of the Paretic and Taboparetic Type. See General Paresis.

6. Neuroses and Psychoses.— These will be discussed under the head of Psychoses, Syphilitic.

7. Hereditary Syphilis.— This is of tremendous importance in its effects upon the nervous system. Statistical studies show that at least 66 per cent of the children of syphilitic parents — without counting the immense number of abortions and of still-born children — show the taint in some form. Fournier places the ratio as high as 98 per cent, and says that 68.5 per cent of the children die. Hochsinger reports that to 70 families, out of a group of 72, in which there was paternal syphilis alone, only 31 healthy children were born, and these in all save four instances were the latest born. Of the remaining 276, 110 were still-born, 166 were syphilitic.

Mott, Mendel and others tell the same tale of the children of paretics and tabetics — either no children, or many abortions, many dead children, and a few living of whose fate there is as yet no certainty. Probably more than half are doomed to some disease or disorder of the nervous system.

Apparently the commonest effect of hereditary infection is the reduction of resistance in the body, and of the powers for full development, in both the general body and nervous tissues. In a manner analogous to the influence of alcohol on the germ cell, syphilis diminishes the vital energy of the plasm prior to conjugation, causing pathological variations in nervous structures, just as it can transmit the disease through the germ cell. In the result, Fournier's classical formula of abortion, dead child, early death, living healthy child, might be amended to read complete sterility, miscarrige, abortion, still-births, children dying in infancy or convulsions, marasmus, meningitis, hydrocephalus, comparatively healthy children who will probably in later life develop late hereditary syphilis. On this point, a study of Mott's family trees will prove valuable and instructive.

Whether syphilis can be transmitted to the third generation has been a much discussed question. Very suggestive material has of late years pointed to the probability that this occurs. Mott of London has shown some very pertinent hereditary material before the Royal Society which is reported in their 'Transactions' for 1912.

The logic of this is clear in the light of the recent observations made by Levaditi, Bab and others that *Treponema pallidum* may be found in the ovum, and in an apparently resting stage, similar to the resting stages known for other flagellate protozoa, closely allied to the organism causing syphilis. Jonathan Hutchinson is sceptical as to this, but he was also sceptical as to juvenile tabes and paresis — possibly in medicine ultra conservatism is psychologically an interesting individual idiosyncrasy rather than a sound pragmatic instinct.

The necessity for the use of all available biological tests in the matter of congenital syphilis is very great, because statistics and opinions uncontrolled by them and unsupported save by clinical observations are not only insecure and insufficient approximations, but, if relied upon in the negative, may retard the progress of thought and delay the relief of sick humanity.

Without losing sight of the immense importance, and the striking and ofttimes grewsome character of the congenital cases which appear in later life, if the physician would place himself in the right attitude toward the therapeutics of this disease, he must focus his attention on the preponderating number of miscarriages, still-births and early syphilitic births. The psychological control, the so-called ethical attitude toward sexual freedom as one of the burning factors in the present cultural struggle for more efficient sexual adaptation, is a problem too large to be entered into here.

Congenital syphilis may occur at any age. It is not infrequently a cause of death of the fœtus, and gives rise to a great variety of intrauterine cerebral diseases which, if the child is born alive, result either in early death, or in early disease, or the later development of various congenital syphilitic manifestations, chief of which are idiocy, imbecility, feeble-mindedness, epilepsy, deafness, optic atrophy, tabes and paresis.

The symptoms are a duplication of those found in the adult types, and the clinical picture is apt to be conglomerate and difficult of analysis. Endarteritis, leptomeningitis, pachymeningitis, gummata, diffuse degenerative changes in the cells of the spinal cord, in the basal ganglia, or in the cortex, all are found and in varying combinations. Consideration will be given here to those trends which are sufficiently accentuated to permit of definite nosological terminology.

Hydrocephalus.— This condition, resultant from congenital syphilis, has been suspected for over two centuries, and was so reported by Haase, Cruveilhier, Von Rosen and Virchow in the last century. In its congenital form, it arises chiefly from syphilitic disease of the cerebrospinal fluid producing structures — choroid, ependyma — or from definite obstructive factors in the cerebral foramina, gummata, vascular swelling obstructing the iter, etc. It frequently follows after congenital syphilis, and is without doubt much more frequent than is commonly realized. Hochsinger cites 10 per cent of hydrocephalus in 362 cases of congenital syphilis. In the series recorded by him, and which gives a fairly average review of the whole situation, the hydrocephalus was sometimes fœtal, and usually began from the 3d to the 11th month after birth. Up to the time that his report was written absence of nervous symptoms were noted in only 11 of the 362 individuals. In the others the phenomena ranged through restlessness, sleeplessness, chronic vomiting, convulsions, contractures, nystagmus and feeble-mindedness.

The ordinary clinical picture is that of an infant of from three to six months old who, apparently without reason, or it may be from a slight blow on the head, or a trivial gastrointestinal or bronchial disturbance, develops within a few days grave cerebral disturbances. The child is very irritable and sleepless, screaming and kicking. The head is usually drawn back, the eyes and the fontanelles are apt to bulge. There is frequent vomiting, and there are signs of oculomotor involvement. Internal strabismus resulting from paresis of the external rectus is a usual sign which is frequently preceded by or accompanied by nystagmus and irregular pupils — often not responding to light. The child cries and struggles, and ofttimes with spasmodic or convulsive movements of the arms it seems to try to brush away the source of the pain which is present in the head; pulling the hair, grasping and rolling the head. It is sometimes possible to demonstrate spasticity, rigidity and other signs of intracerebral pressure. As a rule there is no heightening of temperature, and such signs of epidemic cerebrospinal meningitis as herpes and flushed and spotted skin are absent. There is great difficulty in the diagnosis of all these infantile meningeal disturbances.

Feeble-mindedness.— The very large rôle played by syphilis in the production of mental defectives has been realized only of late years. Early statistics are comparatively worthless. Even recent works — particularly English studies, excepting always those of Mott and his coworkers — show a tendency to minimize its importance, showing an unconscious desire to suppress disagreeable truths.

The intimate correlation between syphilis and feeble-mindedness was first definitely brought out by Fournier, the conclusions being forced upon him by his clinical observations on parasyphilis. Following him the early English, German and American figures varied from 0.01 to 17 per cent, but since the introduction of exact serological investigation they have gone as high as 40 per cent. Feeble-mindedness is thus shown to be the result of more than one cause, but as we are not here dealing with it in its larger aspects we limit ourselves to that of purely syphilitic origin. This may date from intrauterine life, but rarely. Children who are infected thus early usually die, and Plaut (*loc. cit.*) is authority for the statement that so far as syphilis is concerned, feeble-mindedness may be regarded as the result of extrauterine syphilitic disease, incurred in infancy. In some there are signs of an acute brain disease; some cases of recovered hydrocephalus later show signs of havoc in their inability to develop normally. Many simply fail to develop. There are many recorded observations of mental defect of very gradual development, without convulsions or fever, or other signs of organic disease, arriving at a definite termination and leaving behind as a result entirely stationary, perhaps even improvable, idiots or imbeciles.

The Wassermann reaction is frequently shown in Fournier's «enfants arrières,» the type of hereditary syphilitic children described as unintelligent, simple, silly, limited children, always behind.

Nonne's reported cases of general irritable weakness of the nervous system, and the researches of others, convince one that a less marked grade of mental defect, along more restricted or special lines, is closely allied with this broad group as a result of congenital syphilis. The patients are highly excitable, show extreme nervousness and moodiness, suffer from headaches, irregularities of appetite and sudden fits of passion — without other epileptiform analogies. Mercury and the iodides worked wonders for Nonne's cases.

Many so-called psychopathic children are also to be included in this broad group of congenital syphilitics. These children are intellectually bright, but show marked ethical defects, and one can conceive of the mental defect in terms of limited cortical control to the affective response of the sexuality, and to the nutritional instincts. They want, and indulge their wants, without taking the circuitous routes devised by cultural standards. Anatomically one can posit, on the basis of the syphilitic poisoning, a defect or destruction of certain corticocortical association areas. Consult «Treatment of Syphilis of the Nervous System» (in White and Jelliffe, 'Modern Treatment of Nervous Mental Disease,' Vol. I, Philadelphia and New York 1913).

SMITH ELY JELLIFFE.

BRAIN, Tumors of the. Tumors of the brain are relatively infrequent. They occur at all ages, are found in every conceivable location within the cranial cavity and are of a greatly varied pathology. Extensive monographs have been published, and no feature of disease of the nervous system has attracted more attention not only by reason of its practical importance, but also because of the contributions to cerebral localization and function.

The causes for certain tumors, such as tuberculoma, syphiloma, actinomycoses, are well known. For both syphilitic and tuberculous tumors, and possibly other tumors, accident may be an additional element for localization. Metastic tumors follow from their primary sources. Certain teratomata, dermoids, angiomata are congenital conditions, while cholesteomata, chordoma, chondroma, lipoma and myxoma are also developmental anomalies.

The chief forms met with may be classified as (1) true tumors, (2) infectious tumors, (3) parasitic cysts, (4) aneurisms, (5) vascular cysts.

True Tumors.— Of these, gliomata are the most frequent. They preponderate over any other class in adults. Gliomata occur throughout the brain as circumscribed or as diffuse tumors, and are extra- as well as intra-cerebral. The general tendency is toward diffuseness, and degeneration with hæmorrhage, and fatty and cystic formations take place. Thus the symptoms are apt to develop slowly and intermittently in cortex or basal ganglia, occasionally from the ependyma. They may invade an entire hemisphere.

Sarcomata are less frequent, restricting the term sarcoma more strictly than is usual, and rejecting the compromise gliosarcoma. Nearly all gliomata show elements indistinguishable from sarcoma. They usually develop slowly in the brain.

Chloromata are leukemic in origin and are rare. They involve the periosteum or the base and thus cause compression phenomena which often persist for some time.

Fibromata (neurofibromata) are comparatively common brain tumors. They develop chiefly about the cerebellopontine angle (acoustic), but may develop along other cranial nerves. Occasionally they are multiple. They develop slowly.

Endotheliomata are comparatively frequent. They seem to confine themselves chiefly to the anterior fossæ. They are usually small and multiple, develop slowly and chiefly in the falx region.

Chordomata are infrequent, and only rarely reach a considerable size.

Carcinomata, closely related to the endotheliomata are usually secondary (metastic), rarely primary.

Psammomata, chordomata, lopomata, enchondromata, angiomata, osteomata, adenomata, cholesteomata, teratomata (pineal) and dermoids are among the rarities.

Infectious Tumors.— These are tuberculous, syphilitic, actinomycotic.

Tuberculomata are possibly the commonest of all tumors, certainly in children. They are extremely rare after 40 years. They are frequently conglomerate or multiple in type, hence giving rise to mixed syndromes. There may be a few very small miliary tubercles or a large broken-down tubercle mass, with every conceivable intermediary stage. They develop chiefly in the cerebellum, peduncle, basal ganglia, pons and cortex. They have a bad prognosis.

Syphilomata. Gummata are not infrequent They are practically limited to adults, and are not recorded from congenital syphilis. They may appear from one year to 30 years after infection. They occur chiefly as flat, infiltrating, irregular masses, less often as definite nodular masses, chiefly at the base of the brain.

Actinomycosis of the brain is a rarity.

Parasitic Cystic Tumors.— Cysticercus of the brain is a rarity and is secondary.

Aneurismal Tumors.— Aneurisms are very frequent in cerebral vessels. They are mostly small, but large aneurisms occur at times and give symptoms of pressure. They occur in patients usually from 40 to 70 years old, and are mostly of the basilar artery. They cause pressure symptoms at times, with obstructive symptoms — basilar syndrome — or they rupture and produce symptoms of cerebral hæmorrhage.

Symptoms.— Brain tumors, even of a large size, may be found at autopsy, and yet not have given rise to any recognized symptoms. Tuberculomata are thus frequently found in children. With more precise investigation such latent tumors are becoming rarer, especially since the importance of mental symptoms-psychoses, so-called hysterias, etc.— unaccompanied by sensorimotor syndromes, is becoming recognized. Many small tumors, especially osteomata, psammoma, slowly developing and circumscribed gliomata, cholesteomata cause very few symptoms. Occasionally a tumor will show monosymptomatically as by epileptic convulsions, mild speech disturbances, mild sensory defects, optic, olfactory, auditory hallucinations or hemianopsia, without being recognized. The symptoms are best considered as (1) general and (2) local or focal.

The *general* symptoms are indicative of the effects of the tumor as a whole, irrespective of its special nature or localization. They are due to the effects of increased pressure within the brain which appear in certain tumors, notably of the posterior fossa and cerebellum, and are usually marked even with small tumors, whereas tumors elsewhere often may show little of such pressure symptoms. Sometimes the focal symptoms appear before the general ones. General symptoms rarely have any localizing diagnostic value as many of them lie remote from the site of the tumors. Some of the general symptoms of pressure, such as palsies of the muscles of the eyeballs, facial palsy, etc., may even tend to mislead one as to a localizing diagnosis.

The chief symptoms of general value are headache, nausea, vomiting, dizziness, disturbances of breathing and of the heart beat, metabolic changes, mental signs with sleeplessness, sometimes drowsiness and optic nerve changes, and convulsive phenomena. These general symptoms have a tendency to be progressive, but may vary considerably in their intensity from time to time, especially in syphilomata, tuberculomata and gliomata. At times they remain stationary, again they may regress and disappear.

Headache.— This is frequent. Most patients will have headache, especially if the tumor is of protracted growth. Headache is an early sign. Practically every patient with a headache should be questioned and examined for the possibility of its being caused by a brain tumor. The headache usually starts more or less irregularly, is frequently intermittent in the early stages and then becomes persistent, being dull or severe; if dull, with periods of excruciating exacerbation. Daily variations may be noted, and emotional excitement or general causes for increasing pressure within the skull increase it, often with additional symptoms, such as dizziness, vomiting or even agitated or comatose confusions. Migraine-like headaches are very frequent in early stages, particularly in basal cases, hypophysis, basal gummata, neurofibromata, or there may be migraine-like exacerbations on a dull, heavy, gray background of pain. Children usually respond to such variations by attacks of screaming, pulling the hair or beating the head. The headache of tumor of the brain is mostly diffuse, but it may be localized, in which case it may serve to indicate the general site of the tumor. Such is rendered more probable if further substantiated by percussion tenderness, a highly important procedure, percussion dullness and X-ray shadows. The site of a headache is a very uncertain guide for localization purposes, however. Frontal tumors often give rise to headaches in the back of the head, and vice-versa; right-sided tumors to left-sided pains and vice-versa.

Nausea, vomiting and *dizziness* are frequent in late stages of tumor of the brain, and more often found in children and in those patients with rapidly increasing signs of intracranial pressure-posterior fossa tumors particularly. Such vomiting may occur spontaneously — projectile in type — or as an accompaniment of the headache crises, especially when migrainous in type. Vomiting often is absent entirely even with large tumors. When present it more often occurs in the morning.

Cardiac and Respiratory Signs.— Slowness of the pulse, at times marked — 30 to 40 — is a general sign of intracranial pressure, and more especially in marked grades. Hence it is apt to be a late rather than an early symptom, unless one of direct irritation of the vagus (medulla pressure). The bradycardia, at times arrhythmia, may appear periodically during headache exacerbations, or at times independent of the same (acute swelling reaction).

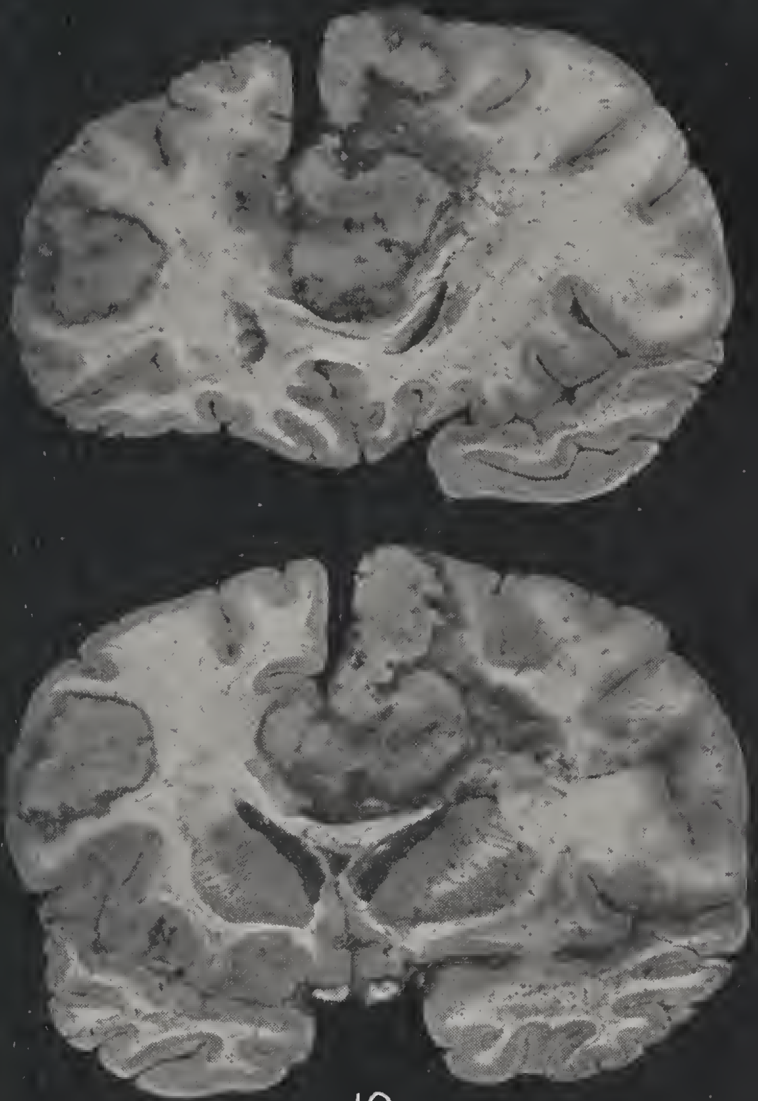
Tumors cause respiratory changes, at times slowness, again irregularity, and Cheyne-Stokes — with acute pressure symptoms (hydrocephalus internus). Hiccoughs, yawning and related respiratory signs are occasionally present.

Metabolic Disturbances.—These are irregular in their development and evolution. Fever is infrequent save as a complication of the late stages. Cachexia and marasmus are present with certain carcinomata, and marked adiposity. Ovarian, and in particular testicular aplasia, are frequent in certain hypophyseal (pituitary) tumors or those causing internal hydrocephalus by possible implication of the infundibular region through general pressure (pineal and corpora quadrigemina tumors).

Mental Sings.— These are of great value, both general and localizing, in from 60 to 85 per cent of the cases. They vary considerably, and are particularly prominent late in the disease, although here masked under the general symptoms of apathy, confusion or coma. Tumors of any region, large and small, independently of their pathological nature, may cause psychical changes. Certain localities cause special psychical alterations to be discussed under focal and localizing symptoms.

In the early stages, slight impairment of attention, with slowness and difficulty in grasp, retardation in motor response and a confusion or bewilderment may be present. Ready forgetting, slight æsthetic lapses and moral breaks — with the telling of shady stories, showing of bad taste, exhibitionistic fancies, even gross lapses — such as open masturbation, etc.— occur. These are the precursors of a more marked grade of retardation of mental function, leading to apathy, listlessness, lack of initiative, at times with confusional episodes — getting lost — fugues, fussiness, emotionalism, etc.

Later stages show typical pictures, not distinguishable from those of arteriosclerotic dementia, or paresis — i.e., so far as the purely mental picture is concerned.



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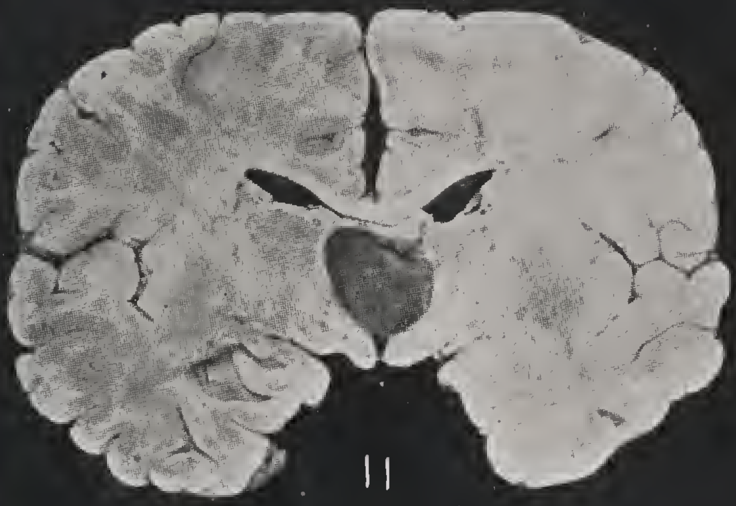

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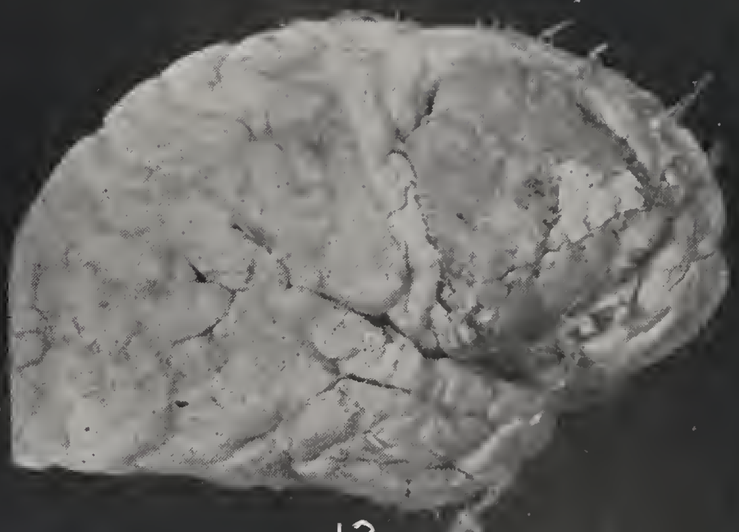

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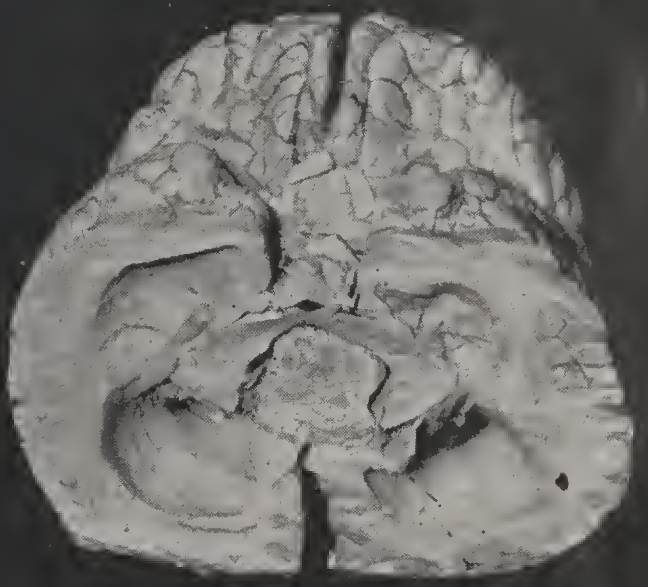

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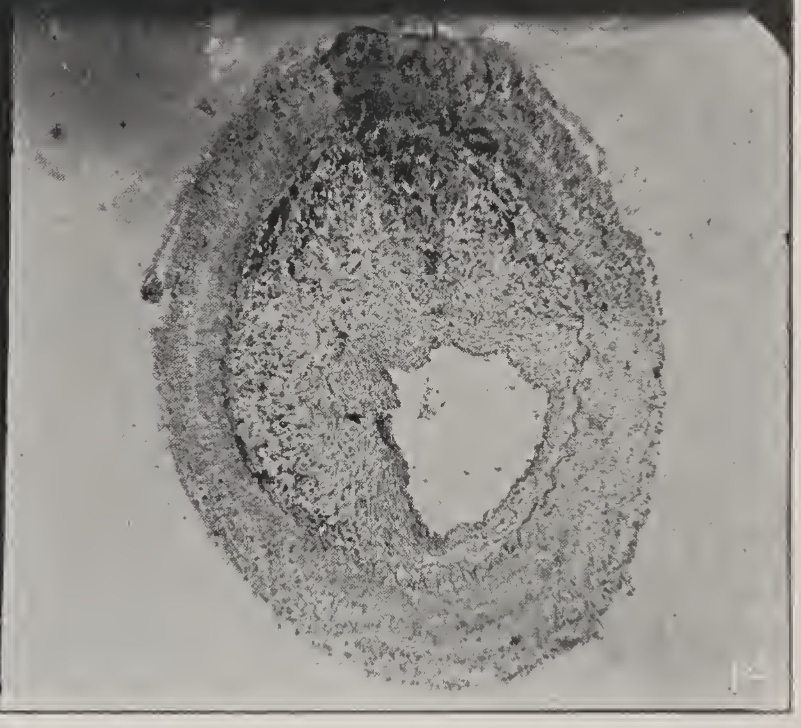

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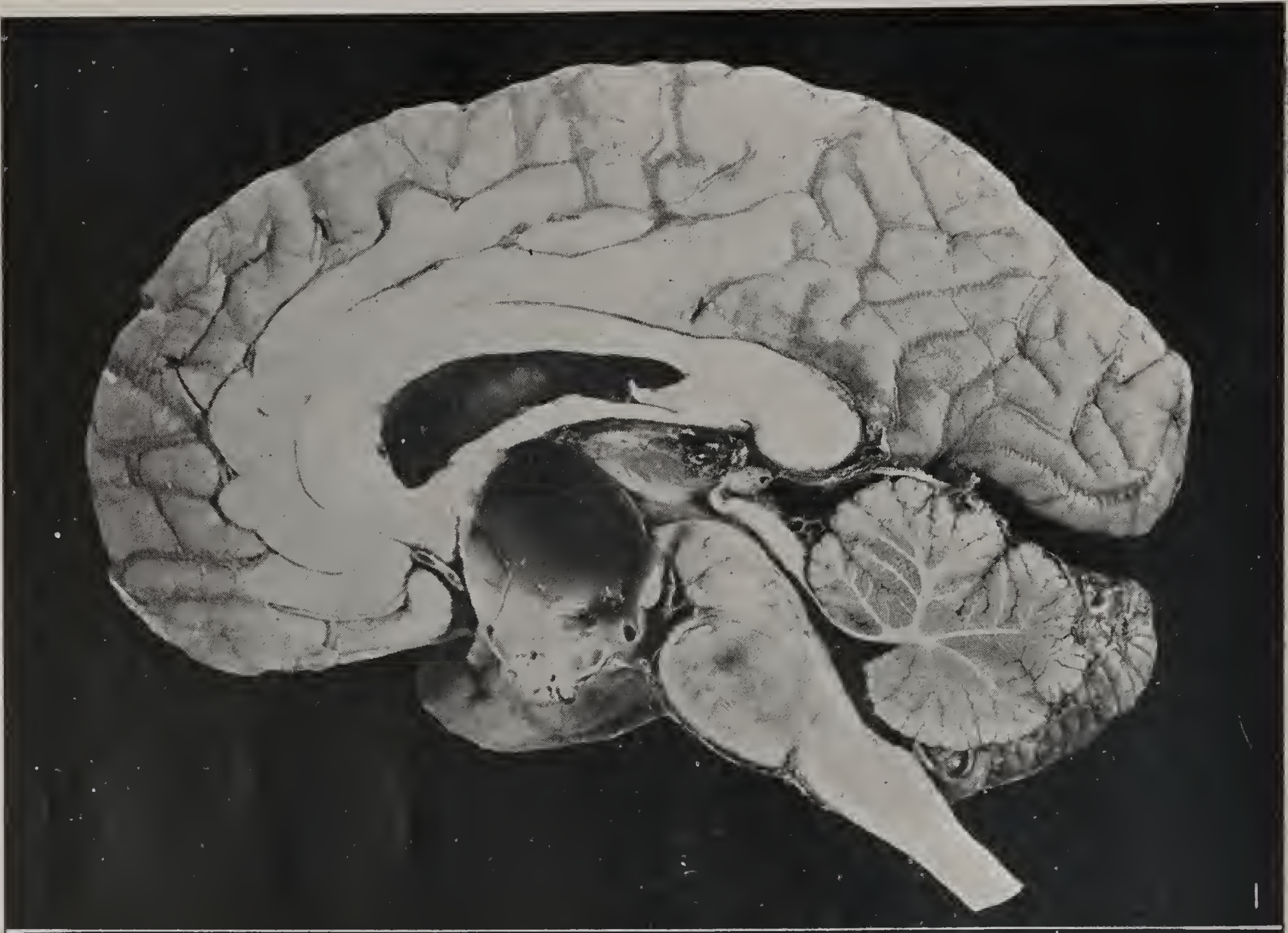
10 Tumor of Multiple Sarcoma of Brain
11 Tumor of Third Ventricle
12 Tumor of Frontal Lobe
13 Tumor — Teratoma of Pineal Gland

14 Syphilitic Disease of Blood Vessels — Frequent cause of brain hemorrhage or apoplexy by rupture of such diseased blood vessels



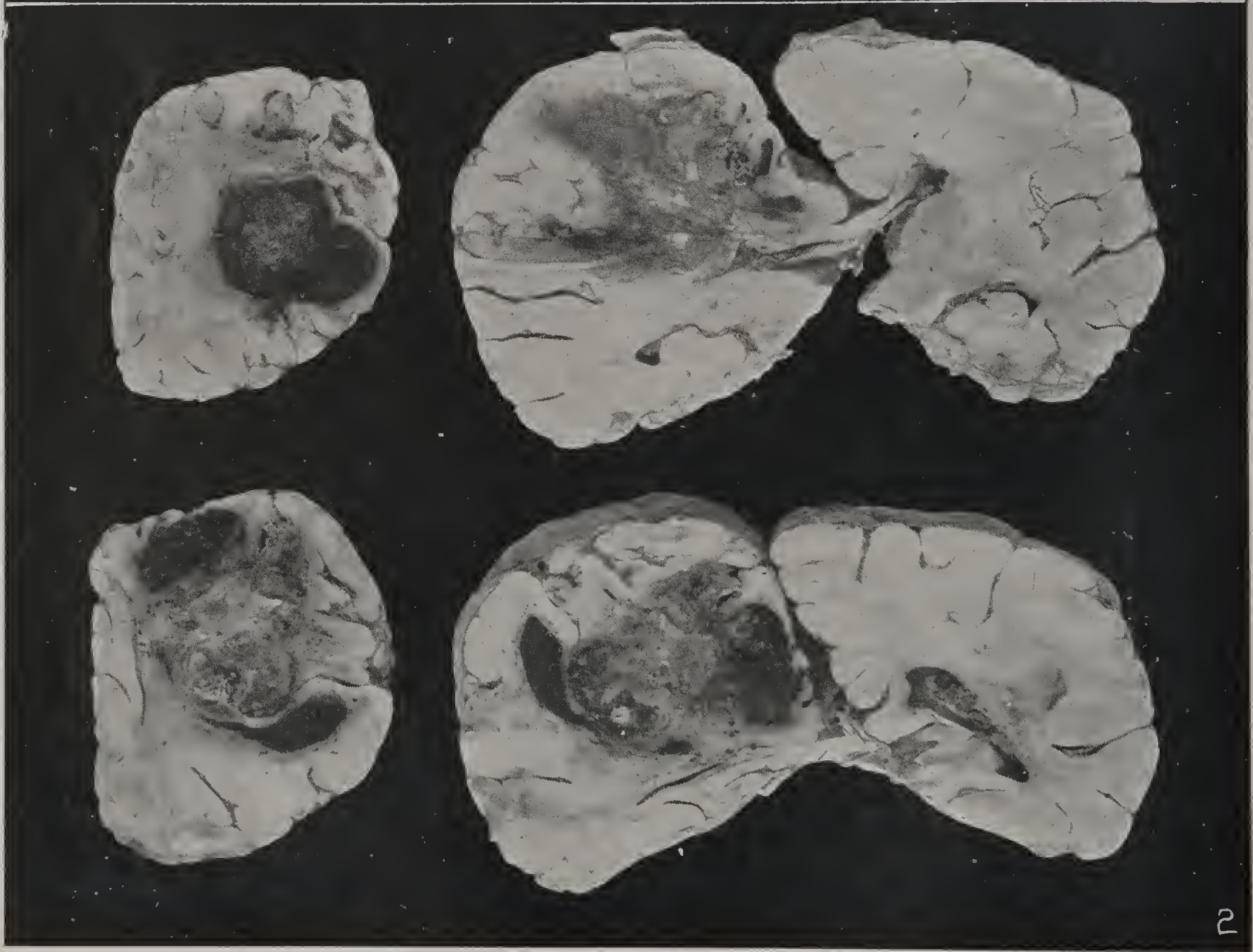


Fig. 1. Cyst of the Hypophysis (Jelliffe and White)
Fig. 2. Gliosarcoma of the Brain. A form of infiltrating tumor (Jelliffe and White)

Certain less general symptoms often present themselves and are of a certain localizing value. Hallucinations of smell speak for olfactory lobe or olfactory tract involvement, those of sight for occipital cortex localization, those of sound for temporal lobe trouble.

The tendency to joke, be facetious, show manic-idea associations, even flight of ideas with euphoria, is at times present. This is more often found in prefontal tumors, especially left-sided, but may occur in tumors of other regions, usually, however, all reaching to and involving the cortex. These symptoms are possibly thalamic over-responses from thalamocortical interference at cortical levels.

Certain patients show definite depressed states — with hypochondriasis or even melancholic suicidal ideas. Others show maniacal pictures with wild flight or marked maniacal delirium. Certain patients develop delirium during certain of their headache paroxysms. Paranoid trends also manifest themselves in a few instances. So-called hysterical symptoms are frequently encountered. Emotionalism and delirium are incorrectly termed hysterical because of a loose application of the term hysteria.

Optic Nerve Changes.— These are of the greatest importance in diagnosis of brain tumor. From 60 to 80 per cent of all patients show optic nerve changes, which vary largely, depending upon the grade of intracranial pressure and the size and location of the tumor. Those tumors causing great intracranial pressure (posterior fossa particularly) naturally cause choked disc and optic neuritis earlier and in more marked degree. Optic nerve changes may be absent even with large tumors, and small tumors of the pons, medulla, motor area, basal ganglia, corpus callosum and hypophysis may give rise to no optic nerve changes. The optic nerve changes develop gradually. They are unilateral, later bilateral or develop bilaterally synchronously. As a rule tumors of one side show beginning nerve changes on the same side earlier and more markedly than on the opposite side.

The visual power may not be lost even with marked grade of swelling or of atrophy, but there is later a gradual loss of vision often seen in early signs by the irregularity of the color field loss (interlacing phenomena, scotomata, etc.).

Motor Phenomena.— These are local or general. Epileptiform attacks are frequent — particularly in children. When limited Jacksonian attacks are present, the localizing value in the motor cortex is evident, save for the few exceptions of pontine, cerebellar and peduncular Jacksonian attacks. Petit mal attacks are also not infrequent. Some patients die in the convulsive seizures.

Focal or Local Symptoms.— These may be among the first of the symptoms encountered, especially in circumscribed cortical tumors, but, as a rule, the focal symptoms develop after the general ones; again they advance together. They are best considered with reference to the areas involved, such as the symptoms of the frontal localizations, central convolutions, parietal lobes, temporal, etc. Frontal lobe tumors are those located ahead of the precentral sulci. Those of the frontal poles, foot of third frontals, are frequently termed prefrontal tumors. The functions of the frontal areas are chiefly those of co-ordination of psychical, chiefly intellectual, processes. They contain motor areas for the innervation of the muscles of the neck, throat and abdominal muscles and the third frontal convolution. The symptoms of tumors lying within the frontal lobes may show considerable variation according to their size and site. Many small tumors located deep in the cortex are apparently symptomless from the neurological point of view. Paranoid states, occasionally seen from such tumors, are readily overlooked, also mildly depressed states which are called neurasthenia. One symptom of special importance is a tendency to make jokes [Witzelzucht] or a tendency to talk or answer beside the point — at times an apparently intentional effort to mislead. One does not necessarily locate a tumor in the frontal lobes by reason of this tendency to joking aloud. At times the behavior is infantile and childish, and diagnosed hysteria. Again patients are irritable, excitable, churlish, even have furious outbreaks of wrath and are violent, capricious or the picture of gradually advancing stupidity, with inability to grasp; loss of initiative, slowness of power of application is seen. In right-handed tumors, the psychical disturbances are more frequent. Orientation for the external world, time and space, is apt to be involved more than personal orientation. Complete disorientation, as in Korsakow's syndrome, is met with. At times hallucinations of smell appear from pressure on the olfactory pathways, or hallucinations of sight, photomata, from similar pressure on optical pathways at the base. Vertigo, with a drunken gait, may be ascribed probably to the higher association of space perceptions and indicates frontal involvement of cerebellar components, the gait being closely related to that of cerebellar syndromes — the patient staggers to the tumor side: adiadokokinesia and asynergia are usually absent here, however.

Involuntary defecation or urination occurs at times; most frequently with somnolent patients.

Apractic disturbances are occasionally met with in frontal tumors, and those involving or pressing upon Broca's convolution, left side, cause mild (paraphasic), or severe motor aphasias in right-handed individuals, usually of gradual onset and often remittent in character.

Other motor signs are stiffness in the neck with forward and backward fixations of the hand and tendencies to tremor of the hand on the tumor side. In a third of the cases, epileptiform attacks, often Jacksonian, occur, from pressure on the motor area.

Central Convolutions.—The functions chiefly involved are those of the voluntary muscular activity, hence paresis, paralysis, spasms. Tumors of this region are never latent. Irritative phenomena, spasms, convulsions, speak for cortical locations; paralysis for deeper-seated lesions involving the pyramidal paths from the motor areas. Small tumors cortically located cause isolated Jacksonian attacks; the more extended the tumor the more widespread the muscular involvement; even small tumors, however, may cause widespread Jacksonian or grand mal symptoms. Often the first observed motion accompanied by tingling affords a clue as to the more definite localization of the tumor; again an orderly and uniform progression in the development of a Jacksonian attack is of value in localization.

Monoplegias and monopareses are not infrequent from small lesions, and in the beginning of the tumor growth. The slow extension of the paresis or paralysis is of diagnostic moment. Advancing hemiplegia is often accompanied by the vasomotor phenomena seen in hæmorrhage, especially in deep-seated lesions. The usual signs of an organic paralysis are present. See PARALYSIS.

Psychical symptoms of general nature are not infrequent. Occasionally large tumors will cause a Korsakow syndrome. Catatonia may also appear. Sensory phenomena are frequent in postcentral convolution tumors. Central convolution tumors are among those more readily localizable, and usually more accessible to operative relief.

Parietal Lobes.— When the tumors press forward toward the posterior central lobes sensory signs are produced. Left-sided tumors, in right-handed persons, especially of the inferior parietal lobes, cause cortical sensory aphasia of Wernicke of various grades. Alexia and agraphia may also be found in left-sided lesions.

Epileptic attacks with hallucinatory auras of taste occur; also a general Korsakow syndrome may develop. Other pathways from the sensory areas may be cut off by tumors in this region; hence either hemianopsias, optic agnosias or optical aphasias (gyrus angularis). Apractic disturbances are of value in localizing left-sided tumors. Katatonic syndromes, confusion, apathy or general loss of orientation may be encountered but are equally present in right-sided and left-sided cases.

Occasionally parietal tumors give rise to ptosis, paresis of the lateral movements of the head and the conjugate motion of the eyes to the opposite side. Deep-seated lesions may impinge upon or involve the motor pathways.

Temporal Lobes.— The cortical end stations of the auditory pathways which are both crossed and uncrossed are chiefly contained in the first and second temporal lobes. Cortical deafness is practically impossible in unilateral lesions but has resulted from bilateral involvement. Word-deafness is the most striking result in left-sided lesions. This is a progressive affair, often beginning with difficulty in finding words, paraphasia, and resulting in more severe forms in alexia, agraphia, logorrhœa and total word-deafness. Large tumors also cause indirect symptoms and may lead, by pressure on motor areas, to total aphasia and epileptiform convulsions. Auditory hallucinations are not infrequent, showing as auræ in generalized grand mal attacks. Gustatory and olfactory phenomena of similar nature result from hippocampal or closely related lesions-uncinate fits. Tumors of the under surface may cause hemianopsia, through pressure on the optic tracts, and by pressure on the pyramidal or fillet tracts cause hemiparesis or hemianæsthesia.

Occipital Lobe.— The end-projections of the optic tracts are located here particularly in and about the calcarine fissure. Complete homonymous hemianopsia is the chief symptom of tumors of this area. This hemianopsia usually spares the papillomacular bundles and is often unperceived by the patient. Quadrant hemianopsia is also found. Tumors may exist and hemianopsia be absent. It is most often present with tumors of the median aspect of the occipital, also with those lying on the convex surface, and hence the more readily removable. Various stages of blindness may also result, and there may exist a mind-blindness from left-sided tumors, also alexia, agraphia and sensory aphasia. Tumors on the inferior surface, by compression of the cerebellum, will cause cerebellar signs, and occasionally palsies result from tumors lying on the external surface of the occipital lobe.

Diagnosis.— Multiple sclerosis, paresis, arteriosclerotic disease, all forms of headache, tuberculous meningitis, chronic hydrocephalus and hysteria are the chief conditions causing difficulty. Multiple sclerosis, if the patches are solely cerebral, may cause confusion, especially in the acute cases, as described by Marburg and others. The bitemporal pallor of the discs in this disorder differs from the usual pressure changes in the disc. Nystagmus is not a frequent brain-tumor sign. Other signs of pyramidal tract implication may be identical. Headaches are usually absent, also nausea and vomiting. Pseudoparetic and arteriosclerotic psychical syndromes (Korsakow's psychosis) are frequently confused with cerebral tumor, i.e., the cause of the mental picture is overlooked. Thus a tumor, which might have been removed, has been missed under the psychotic disguise. Eye-ground changes are usually positive in these cases, yet may be absent. Headache should always be scrutinized carefully. A postinfluenzal occipital headache which is very frequent and extremely severe and persistent is frequently highly suggestive of brain tumor. The headaches from lead poisoning, anæmia and nephritis are also to be excluded. Brain abscess and tuberculous meningitis must be excluded on the ground of their difference in development of symptoms. Symptomatically speaking they may be considered as tumors. This is also true of chronic hydrocephalus. Cerebral puncture, withdrawing a small plug of brain tissue through a trephine opening, and canula is often of great aid in diagnosing very puzzling cases.

Prognosis.— No definite prognosis can be laid down. Everything depends on the site of the tumor. In general, apart from surgical relief and from medical treatment of syphilomata, the outlook is pessimistic. Sudden death is not infrequent and lumbar puncture is an extremely dangerous procedure with brain tumor, often leading to sudden collapse and death, especially with tumors of the posterior fossa. Syphilomata and gummata of the brain have a fair prognosis. Better results are obtained with mercury by inunction and by iodides than by salvarsan in the beginning treatment. Salvarsan may be used later to attempt to kill off all the spirochetes, but with well-advanced syphilomata, salvarsan is apt to set up a dangerous reaction. Round, hard gummata do not absorb, as a rule, and are best considered surgically.

Treatment.— Medical treatment, excepting for syphilomata, is useless, and involves a waste of valuable time. The chief objects to be attained are early diagnosis, immediate exclusion of syphilis by serological tests, eyeground examination with particular study of the color fields, exact localization as soon as possible, and surgical removal or palliation (decompression) to save the eyesight or to gain time for a more exact localization.

The details for applying these principles have already been noted. The results to be expected in any particular case are problematical, yet from 10 to 20 per cent of all brain tumors (seen in the large) have been removable, with at least in 10 per cent practical recovery. Even with such chances against him the patient should have the benefit of the doubt if a competent surgeon is available. Surgical skill is a very large factor in the results; a good abdominal surgeon is not necessarily a good brain surgeon. The brain is semi-fluid and an intricate switchboard of highly important structures; there are no unimportant areas in the brain; many surgeons have treated it in the past as though it were an abdominal viscus. The results have been disappointing. Most brain operations are best done in two stages. Decompression, usually subtemporal, alone is often the only possible procedure. It often relieves a recently acquired blindness. The situation referable to brain surgery for cerebral tumors is rapidly advancing, and better results are being obtained and regions hitherto impossible to reach (hypophysis, etc.) have been approached with results which a decade ago would have been impossible. Notwithstanding all this, the general attitude should be one of extreme caution. Consult Jelliffe and White, ‘Diseases of the Nervous System’ (1917).

SMITH ELY JELLIFFE.

BRAIN FEVER. See ENCEPHALITIS; MENINGITIS.

BRAINARD, David Legge, American army soldier and explorer: b. Norway, N. Y., 21 Dec. 1856. He received his education in the common schools and in the State Normal School, Cortland. In 1876 he joined the United States army as a private and served under General Miles in several Indian campaigns. In 1881–83 he was with the Lady Franklin Arctic Expedition as 1st sergeant. Soon after his return he was transferred to the Signal Corps and later received his commission of 2d lieutenant in the 2d United States Cavalry. In 1897 he was with the Alaska relief expedition, attained the rank of colonel in the following year and in 1900 was despatched to the Philippines as major of the commissariat department. He was appointed deputy commissary-general of the army in 1905 and in 1914 went as military attaché to the United States embassy in Argentina.

BRAINE, Daniel Lawrence, American naval officer: b. New York, 18 May 1829; d. 30 Jan. 1898. He entered the United States navy in 1846 and became a rear-admiral. He served with distinction through the Mexican and Civil wars. In 1873 he obtained the surrender by Spain of 102 survivors of the *Virginius* prisoners.

BRAINERD, David, a missionary to the Indians: b. Haddam, Conn., 20 April 1718; d. Northampton, Mass., 9 Oct. 1747. Early impressible by religious influences, he felt himself suddenly converted while taking a walk, 12 July 1739, and the same year entered Yale College to prepare himself for the ministry. Instead of graduating in the regular course he was expelled from the institution in 1742 for having said, in his zeal, of one of the tutors, that he had no more of the grace of God than a chair. He was, however, licensed in July as a preacher, and received an appointment from the Society for the Propagation of Christian Knowledge, as missionary among the Indians near Stockbridge, Mass. He was ordained in 1744, and took up his work among the Indians at the forks of the Delaware in Pennsylvania, making two visits to the Indians of the Susquehanna. He met, however, with but little success, until, after a year, he went to reside among those at Crossweeksung, near Newark, N. J. Here he is said to have produced a great change among the savages, and to have baptized 78, of whom 38 were adults. Having worn out his health by his labors, he set out on a journey to Boston in the spring of 1747, and thence to Northampton, where he died after a short stay in the family of Jonathan Edwards, by whom his biography was soon afterward written. His published works are ‘Wonders of God Among the Indians,’ and ‘Grace Displayed.’

BRAINERD, Thomas, American clergyman: b. Leyden, N. Y., 17 June 1804; d. Scranton, Pa., 21 Aug. 1866. He taught school, studied law and finally turning to theology, he was graduated from Andover Theological Seminary (1831). Two years' preaching at Cincinnati made for him a reputation as an orator. But he left his charge to become editor of the Cincinnati *Journal.* In 1836 he was appointed commissioner to the General Assembly and the following year he was called to Pine Street Church, Philadelphia, a position he was destined to hold till his death. He was closely connected with Dr. Lyman Beecher whose «new school» theological movement he enthusiastically supported. His published works include ‘Life of John Brainerd’ and numerous sermons.

BRAINERD, Minn., city and county-seat of Crow Wing County, 115 miles west of Duluth, situated on the east bank of the Mississippi River, and on the Northern Pacific and the Minnesota Int. railroads. It lies in a fertile farming region and trades in grain, hay and other agricultural produce. Lumber and furs and iron are also exported. Here are situated the extensive shops of the Northern Pacific Railroad. There are foundries, flour-mills, a large saw-mill, lumber yards, cigar factories, paper and pulp mills. The Coyuna iron range extends through the city. There is a United States signal service station, a hospital for employees of the Northern Pacific Railroad, and another for lumbermen, a courthouse, Carnegie library, Y. M. C. A. building, a public park and electric street railway. The city is governed by a mayor, elected biennially, and a city council. Water power is furnished by a dam across the Mississippi. The waterworks and electric-light plant are operated by city. Pop. 10,000.

BRAINSTONE CORAL, a madrepore of the genus *Meandrina,* so named from the general resemblance to the brain of man exhibited in its large rounded mass and numerous winding depressions. When the hemispherical mass is broken, the ridges which bound its furrows (each of which represents the place of a polyp) may be traced inward through its substance.

BRAINTREE, Mass., town in Norfolk County, on the New York, N. H. & H. Railroad, 10 miles south of Boston. It contains the villages of South and East Braintree; is connected by electric street railroads with the principal neighboring towns and villages, and its industries include granite-quarrying and metal working, and the manufacture of rails, tacks, shoes, wool, rubber goods, fans, conductors' punches, etc. Thayer Academy and Thayer Public Library are situated in South Braintree. John Adams, John Quincy Adams and John Hancock were born in a part of Braintree now within the limits of Quincy, which until 1792 was included in the township of Braintree. Randolph was also included therein until 1793. The town was settled about 1634, from land belonging to Boston and called Mount Wollaston. Here, at «Merry Mount,» Thomas Morton (q.v.) had, in 1625, established a settlement which had greatly scandalized the Pilgrims of Plymouth, and was later abandoned. Braintree was incorporated in 1640. The government is by town meetings. The waterworks and electric-light plant are owned by the municipality. Pop. 10,554. Consult Adams, C. F., ‹Three Episodes of Massachusetts History› (Boston 1892); Pattee, W. S., ‹History of Old Braintree and Quincy› (Quincy 1878); Wilson, D. M., ‹Quincy, Old Braintree and Merry Mount› (Boston 1906).

BRAINTREE RESOLUTIONS, instructions given by the town of Braintree, Mass., on 24 Sept. 1765, to its representative in the Massachusetts General Court, Ebenezer Thayer, relative to his action in the matter of the Stamp Act. They were drawn by John Adams, one of a committee appointed by the Braintree town meeting for that purpose, accepted unanimously and published in the Boston *Gazette*. Some 40 Massachusetts towns subsequently adopted them verbatim as their instructions to their own representatives; and John Adams says that Samuel Adams copied several paragraphs into his own draft for the Boston town meeting. The resolutions declared the tax, even if legal, an unbearable burden and a vexatious interference with the business of a poor and sparsely settled province; that, moreover, it was contrary to British common law, and the «foundation principles of the British constitution, that we should be subject to any tax imposed by the British Parliament, because we are not represented in that assembly in any sense, unless it be by a fiction of law»; that to put the cases in the decision of one judge without a jury was «an alarming extension of the power of courts of admiralty,» and repugnant to the Great Charter itself, especially as the judges held office only during the pleasure of the Crown, and moreover had a commission on the goods condemned. They enjoin the Braintree representative to «comply with no measures or proposals» for executing the law, but «by all lawful means» to obstruct it; to favor entering on the public records «the most clear and explicit assertion of our rights and liberties»; and — most significant of all — «to agree to no steps for the protection of the stamped paper or the stamp officers, because any addition to the laws for preserving the peace would only exasperate the people and endanger public tranquillity.»

BRAITH, brīt, **Anton,** German painter: b. Biberach, Würtemberg, 1836; d. 1905. He was educated at the Stuttgart Art School and the Munich Academy, and soon obtained distinction by his skill in landscape and animal painting. Among his best works are ‹A Yoke of Oxen›; ‹A Grazing Herd›; ‹Going to Drink›; ‹Herd Overtaken by a Storm›; ‹After the Storm›; ‹The Peasant Woman's Pet›; and ‹A Bright Morning.›

BRAKE, BRACKEN, common names for a fern (*Pteridium aquilinum*) of the family *Polypodiaceæ,* widely distributed in Europe, Asia and North America, where it often dominates the vegetation of heaths, neglected meadows, etc. It does not fall when the top is killed by frost, and affords excellent cover for small game. From its long, creeping rootstocks, naked stalks, 6 to 20 inches in length, or sometimes much larger, are sent up. Each stalk produces three branches with numerous fern-like pinnate leaves, along the covered edges of which are borne the sori, or spore-producing organs. The rootstock, which is bitter, has been used as a substitute for hops in beer-making, and is still somewhat employed in dressing chamois and kid leather. The tops are often used for bedding animals, and are sometimes mixed with hay as fodder. Although land covered with brake is considered inferior, many such soils, when cultivated, are found to be good. By frequent mowing, or by plowing, the land is readily freed from brake. Several other species of *Pteridium* have been called brake and bracken, and some are cultivated as ornamental plants in greenhouses and window-gardens. The rootstocks of a New Zealand species (*P. esculentum*) are often used for food, and are better suited for such use than those of the first-named species, which have served such a purpose only when ordinary food-supply has been scarce.

BRAKE, a mechanical device for retarding or arresting by means of friction the motion of a wheel or shaft. A wood or metal block, so arranged as to be pressed by levers against the rim of a wheel, constitutes a shoe-brake, the kind used in checking ordinary vehicles, such as wagons. A band passing around a wheel, and which, by tightening, retards its motion, forms a band-brake. The air-brake is the form of mechanism generally used on railroads. See Air-brake.

BRAKLONDE, Jocelin de, English chronicler: b. Bury Saint Edmunds, in the 12th century. He was trained as a novice under Samson of Tottington; in 1182 became chaplain to Samson was elected abbot in that year and was later successively guest master (1196–1200) and almoner (1212). In 1173 he entered the convent of Saint Edmunds and began his chronicle which extends over a period of nearly 30 years. This was edited by J. G. Rokewood for the Camden Society. The character of the abbot Samson, described in these annals, influenced Carlyle in the writing of ‹Past and Present.›

BRAMANTE, brä-män′tĕ, **Donato d'Agnolo,** Italian architect: b. Monte Asdroaldo, near Urbino, about 1444; d. 11 March 1514. He applied himself first to painting, but his passion for architecture soon gained the ascendency and he shares with Brunelleschi the credit of restoring this art. While yet a young men he went to Milan, where his time was mainly spent at the cathedral. Pope Alexander VI named him as his architect and Julius II made him superintendent of his buildings. At the command of the latter he united the Belvidere with the palace of the Vatican. He persuaded the Pope to order the church of Saint Peter to be torn down and another to be erected in its place, which should be without an equal in the world. In 1513 the foundation of the present Saint Peter's was laid, according to the plan of Bramante. It yet remains the greatest achievement of modern architecture. Bramante did not live to see this work completed. He had begun the edifice with incredible dispatch, but his successors, Raphael, Julius of San Gallo, Peruzzi and Michelangelo, altered the original plan and left nothing of Bramante's workmanship standing except the arches which support the tower of the dome. His writings, in prose and verse, first discovered in 1756, were printed in the same year at Milan.

BRAMATHERIUM, a genus of *antilopidæ,* consisting of a gigantic species with four horns arranged in two pairs, the posterior larger and palmated; the neck is short and the limbs equal. It is allied to sivatherium, which also is four-horned. Both occur in the Upper Miocene, or Lower Pliocene beds of the Sewâlik Hills in India.

BRAMBACH, bräm'baн, **Kaspar Joseph,** German composer: b. Bonn, 14 July 1833; d. there 1902. He was a pupil at the Conservatory of Cologne (1851–54) and at Frankfort-on-the-Main he studied under Ferdinand Hiller. In 1859 he became a teacher at the Cologne Conservatory and in 1861 went to Bonn as state musical director. Giving up that position in 1869, he devoted himself to the work of composing and private teaching. His best works are his cantatas, including ‹The Eleusinian Festival›; ‹A. Hymn to Spring›; ‹The Power of Song›; ‹Alcestis›; ‹Prometheus›; ‹Columbus›; and ‹Lorelei.› He also wrote an opera, ‹Ariadne› and several minor pieces, which were very popular and still hold the stage.

BRAMBLE, a common, but, in America, little used name for various thorny species of the genus *Rubus,* including blackberry, raspberry and dewberry.

BRAMBLING, or **MOUNTAIN FINCH,** a large migratory finch (*Fringilla montifringilla*), found throughout Europe and in Asia, where it breeds in the northern parts. It is a brightly colored bird and nearly related to the chaffinch.

BRAMPTON, Canada, the county-seat of Peel County, Ontario, is situated on the Grand Trunk and Canadian Pac. railways, 21 miles west of Toronto. It has boot and shoe manufactories, flour, wool and knitting mills, brick yards, preserve factories and six cut-flower establishments. Pop. 3,412.

BRAMWELL, Byron, English physician: b. 18 Dec. 1847. He was educated at Cheltenham College and graduated M.B. at Edinburgh University in 1869. After serving as house surgeon in Edinburgh Royal Infirmary, he engaged in general practice in North Shields and held important public appointments which he resigned in order to return to Edinburgh. He was appointed pathologist to Edinburgh Royal Infirmary in 1882 and is now consulting physician in the same institution. He has been president of the Royal College of Physicians, Edinburgh. His publications include ‹Atlas of Clinical Medicine› (3 vols.); ‹Studies in Clinical Medicine› (8 vols.); ‹Diseases of the Spinal Cord›; ‹Practical Medicine and Medical Diagnosis›; ‹Lectures on Aphasia,› etc.

BRAMWELL, John Milne, English physician and author: b. Perth, 11 May 1852. He graduated at Edinburgh University in 1873, engaged in private practice at Goole, Yorkshire, which he abandoned in order to pursue hypnotic researches. He has since published a number of works, mainly dealing with hypnotism as applied to medicine.

BRAN, the husks of ground wheat, rye, corn or other cereals, separated from the flour. The nutritive value of these husks increases as we proceed from the outside of the grain toward the interior. The outer skin, or coarse bran, is very indigestible, owing to the presence of silica. The inner skins, called pollards, are more nutritious, containing from 12 to 15 per cent of nitrogenous matter and from 20 to 50 per cent of starch. Unless ground very finely, however, they have been known to occasion irritation of the bowels and, in some cases, diarrhœa. Though rich in nitrogen, bran appears to possess but little nutritive value as human food. It may be of use to the well-fed, who need a laxative, but to the poor who need nourishment it is of very little use. It is, however, of some commercial value, being largely employed in the feeding of horses, cattle and other live stock. The preponderating volume of bran on the market is wheat bran, which is produced at the rate of 45 pounds for every barrel of flour manufactured. The analysis of wheat bran shows it to be composed of starch, 52 per cent; gluten (gliadin and glutenin), 14.9 per cent; fat, 3.6 per cent; sugar, 1 per cent; wood fibre, 9.7 per cent; salts, 5 per cent; water, 13.8 per cent. As compared with flour, wheat bran contains one-fourth less starch; one-fourth more gluten; three times as much fat; and seven times as much mineral salts. Rice bran contains twice as much fat as wheat bran but less proteids and as a rule has a proportion of the siliceous rice hulls which are liable to cause fatal digestive ailments in live stock. Another commercial use for wheat bran is brightening goods during the process of dyeing and calico printing.

BRANCH, John, American statesman: b. Halifax County, N. C., 4 Nov. 1782; d. Enfield, N. C., 4 Jan. 1863. He was graduated at the University of North Carolina (1801), studied law, became a judge of the superior court, State senator (1811–17). He was governor of his State (1817–20) and a member of the United States Senate (1823–29). He was appointed Secretary of the Navy by President Jackson and held this office till the breaking up of the Cabinet in 1831. In 1835 he was a member of the convention to revise the State constitution and in 1843 was appointed governor of the Territory of Florida, serving until the election of a governor under the State constitution, when he retired to private life.

Consult Lanman, ‹Biographical Annals of the Civil Government of the United States.›

BRANCH, that portion of a plant produced from a lateral leaf bud on the primary axis or stem. It is looked upon as part of the stem and not as a distinct organ. A branch generally produces secondary branches and these give rise to minor ramifications, called branchlets or twigs. Branching is exhibited both by Cormophytes and by Thallophytes. It may be dichotomous, where every branching is a bifurcation of an already existing growing-point or monopodial, by the formation of new growing-points. True dichotomy is rare in flowering plants, if present at all. Dichotomy may or may not be equal; if one branch continually predominates at each bifurcation, as in Selaginella, an apparent principal axis called a sympodium results. On the other hand, as in the lilac, the suppression of the principal axis at each point of branching may cause a monopodial branching to assume the form of a dichotomy, or even of a polytomy. This is known as false dichotomy or polytomy. Sympodia may be formed in monopodial branching by the suppression of the terminal buds, as in the lime and the beech. In some trees, such as the pine, the original axis remains predominant throughout the life of the plant, while in others, such as the elm, the lateral shoots are as strong as the axis, or even stronger.

BRANCHIDÆ, the name of an hereditary family, the descendants of Branchus; also of a place founded by them. Their original seat was a little south of Miletus in Ionia, where was the famous temple of Apollo Didymeus. After the destruction of the temple, probably toward the close of the 5th century B.C., an attempt was made to rebuild it, but on so colossal a scale that the project was never completed. Its ruins are of great interest to archæologists. Some of the statues, formerly erected along the road leading to the temple, have been removed to the British Museum.

BRANCHIOPODA, a division of crustacea of the suborder *Entomostraca*. They are for the most part miscroscopic, and are chiefly distinguished by having the gills attached to the legs, which are generally numerous. There are three families containing about a half-dozen genera. The body is sometimes naked, but more frequently is enveloped by a buckler, which in some covers only the head of the thorax, and in others the whole body. Some have two or even three eyes, but a greater number have one only. They are all free and continually in motion. Among the Branchiopoda are the water-fleas and brine shrimps, and some also rank the trilobite among them.

BRANCHIOSAURUS, an extinct genus of *Amphibia* (q.v.), whose remains have been found very abundant and very perfectly preserved in the Permian shales of Saxony. It is of especial interest among fossil amphibians because it has been possible to study every stage of its development from embryo to adult. The animal was but a few inches long, proportioned like a salamander, with four limbs and five toes on each foot. Like the modern tadpole, the larva breathed by external gills which were replaced by lungs in the adult.

BRANCO, RIO, a river of North Brazil, the chief tributary of the Rio Negro. It is 400 miles in length, but 250 miles from its confluence with the Rio Negro navigation is blocked by falls. It rises near the frontier of Venezuela in the Parima Mountains, flows southwest and is navigable by light draught vessels.

BRAND, Sir Jan Hendrik, Boer statesman: b. Cape Town, 6 Dec. 1823; d. 15 July 1888. He studied law in Leyden and in 1849 began to practise in the Supreme Court at Cape Town. In 1853 he became professor of law in the South African College. He early became prominent in public affairs, his sympathies being strongly pro-British. His influence prevented any participation of the Orange Free State in the movement to check British policy in South Africa. In 1863 he was elected president of the Orange Free State and was reelected every five years until his death. Queen Victoria knighted him in recognition of his aid. Brandford was named in his honor and Ladybrand was named in honor of his wife.

BRANDE, William Thomas, English chemist: b. London, 11 Feb. 1788; d. Tunbridge Wells, England, 11 Feb. 1866. He was educated at Westminster School, studied medicine and became an assistant to Sir Humphry Davy, succeeding him in 1813 in the chair of chemistry at the Royal Institution. In 1828 he became a superintendent in the mint. From 1816 to 1836 he and Faraday were joint editors of the *Quarterly Journal of Science and Art*. In 1853 he received the honorary degree of D.C.L. from Oxford. He wrote several standard books on chemistry. His chief works are ‹A Manual of Chemistry,› ‹Outlines of Geology,› and an ‹Encyclopædia of Literature, Science and Art› (1842).

BRANDEGEE, Frank Bosworth, American legislator: b. New London, Conn., 8 July 1864. A graduate of Yale University, he became a lawyer, was elected to the Connecticut house of representatives in 1888, and in 1899 acted as speaker. He was corporation counsel of the city of New London during 10 years, and was selected as delegate to four Republican national conventions. To fill an unexpired term in 1902 he was elected to Congress and was re-elected in 1903 and again in 1905, when he was elected United States senator to fill the unexpired term of the late O. H. Platt; in 1909 he was re-elected for the term to expire in 1915 and again in 1914 for the term to expire in 1921. He was chairman of the committee on Pacific railroads and member of committee on interoceanic canals, interstate commerce judiciary, patents, etc.

BRANDEIS, brăn'dīs, **Frederick**, American organist: b. Vienna, Austria, 1835; d. New York 1899. At Vienna he studied under Fischof, Czerny and Rufinatscha. He toured America in 1849 as a member of the Wallace Opera Company. In 1851 he settled in New York, and between 1865–98 filled positions as organist at the Catholic churches of Saint John the Evangelist and Saint James, and the 44th Street Synagogue and the church of Saint Peter and Saint Paul in Brooklyn. He wrote a prelude to ‹Maria Stuart›; ‹The Sunken Cloister›; a suite for string orchestra, and numerous other pieces, instrumental and vocal. He is best remembered for his song, ‹My Love is Like the Red, Red Rose.›

BRANDEIS, Louis Dembitz, American jurist: b. Louisville, Ky., 13 Nov. 1856. He was educated in the Louisville public and high schools, at the Annen Realschule, Dresden, 1873–75, and at Harvard University, where he received the degree of LL.B. in 1877. He was admitted to the bar the following year. From 1879 to 1916 he practised in Boston, being a member of the firm of Warren & Brandeis until 1897, and of Brandeis, Dunbar & Nutter, 1897–1916. In 1910 he was counsel for Luther B. Glavis in the Ballinger-Pinchot investigation; in 1911 counsel for shippers in the advanced freight rate investigation before the Interstate Commerce Commission; in 1913–14 special counsel for the Interstate Commerce Commission in the second advanced freight rate case; in 1915 he was special counsel for the government in the Riggs National Bank case. In 1914 he was counsel for the people in the proceedings involving the constitutionality of the women's ten-hour laws in Oregon and Illinois, the California eight-hour law and the minimum wage law in Oregon. He was also counsel for the people in the preservation of the Boston municipal subways system and the establishment of the Boston sliding scale gas system and the Massachusetts savings bank insurance. In the years between 1906 and 1913 he was people's counsel in opposing the New Haven monopoly of transportation in New England. He was also chairman of the arbitration board in the New York garment workers' strike in 1910. In 1914–15 he was chairman of the provisional committee for general Zionist affairs. In 1916 he was nominated by President Wilson justice of the Supreme Court of the United States, and despite considerable opposition the nomination was confirmed by the Senate. He is the first man of his race and creed in the Supreme Court of the United States. His writings include articles on public franchises in Massachusetts, life insurance, wage-earners' life insurance, scientific management of labor problems and the trusts and Zionist and Jewish problems.

BRANDENBURG, Germany, a province of Prussia, surrounded mainly by Mecklenburg and the provinces of Pomerania, Posen, Silesia and Prussian Saxony. The soil consists in many parts of barren sands, heaths and moors, yet the province produces much grain, as well as fruits, hemp, flax, tobacco, etc., and supports many sheep. The forests are extensive. The principal streams are the Elbe, the Oder, the Havel and the Spree. There are between 600 and 700 lakes, and some of them are connected by canals with the great rivers. Brandenburg carries on an active trade in manufactured articles, containing extensive silk, woolen, linen and cotton cloth and yarn mills, also establishments for dyeing, spinning and printing of textiles, machine shops, cigar and cigarette factories, glass and chemical works. Beer and liquors are produced in large quantities. It includes, besides some other districts, the greater part of the former Mark of Brandenburg, which formed the cradle of the Prussian monarchy and the centre round which the present extensive kingdom has grown up. It is divided into the three administrative divisions of Berlin, Potsdam and Frankfort, and has a total of 15,381 square miles. The most of the inhabitants are Lutherans; the rest are chiefly Roman Catholics and Jews. From 1685 to 1688 many French refugees, Walloons and inhabitants of Lorraine and of the Palatinate settled in the Mark. At present Brandenburg is the most important of the Prussian provinces, including as it does the capital (Berlin), and the governments of Potsdam and Frankfort. The first people who are known to have inhabited Brandenburg were the Suevi. They were succeeded by the Slavonians, a barbarous people, whom Henry I conquered and converted to Christianity in the early part of the 10th century. The government was first conferred on a Saxon count, and did not become hereditary until the time of Albert, whose son succeeded to the dignity of elector in 1180. This race becoming extinct, Charles IV assigned the electorate to his son Sigismund, who became emperor in 1415, and sold the region to Frederick, Burgrave of Nuremberg, the ancestor of the present reigning family. Frederick William the Great made various accessions to the territory of his ancestors, and obliged the King of Poland, in 1656, to declare Prussia an independent state. The Old Mark was ceded to Napoleon in 1807, and formed part of the kingdom of Westphalia, but it was restored to Prussia in 1814. The Elector of Brandenburg held the seventh rank among the electors of the empire and had five votes in the Council of Princes. Pop. about 4,000,000. See PRUSSIA.

BRANDENBURG, Germany, Prussian city in the administrative district of Potsdam and province of Brandenburg, on the Havel, 35 miles west of Berlin, formerly the residence of the reigning family of Prussia. The Havel here expands into a lake and divides Brandenburg into the Old Town, the New Town and the Cathedral Island, the last containing a castle and the cathedral. The latter is a late Romanesque building (1170–1318), restored in the 19th century. The industries embrace woolen yarn, silk goods, baskets, leather, hosiery, paper, beer, linen, etc., and the building of boats is also carried on. Pop. about 55,000. It became the seat of a bishopric in 949. From 27 Nov. to 5 Dec. 1848, Brandenburg was the seat of the National Assembly of Prussia.

BRANDENBURG, Confession of, a confession of faith issued in 1614 by the Elector of Brandenburg. It was an attempt to reconcile the religious controversies growing out of the differences in Lutheran and Calvinistic doctrine. It had authority in the churches of Brandenburg until the union of the Lutheran and Reformed churches in 1817.

BRANDENBURG, New. See NEU BRANDENBURG.

BRANDES, bran'dĕs, **Carl Edvard Cohen,** Danish author: b. Copenhagen 1847. A brother of the celebrated literary critic Georg Brandes, he also became known as a novelist, dramatist and writer on drama and philosophy. Among his novels are 'Das junge Blut' (1889); 'Ein Politiker' (1889); and his dramatic works include 'Heilmittel' (1880); 'Lägemidler' (1181); 'Ein Besuch' (1882); 'Ein Bruch' (1885); 'Liebe' (1887); 'Under Loven' (1890); 'Unter dem Gesetz' (1890); 'Hos Sighrit' (1902).

BRANDES, Georg Morris Cohen, Danish literary critic of Jewish family: b. Copenhagen, 4 Feb. 1842. He was graduated at the University of Copenhagen in 1864, and taught there 1872–77. Several books on æsthetic and philosophic subjects brought on him a charge of skepticism which was not removed by an epoch-making series of lectures, delivered before large audiences, and published under the title ‹The Main Literary Currents of the Nineteenth Century› (1872–82); for his description of the later intellectual position of Europe, as broken away from the orthodoxy and romanticism of the beginning of the century, brought on him the bitter attacks of all the reactionary forces in Denmark. His ‹Danske Digtere,› a masterpiece of psychological analysis, appeared in 1877; but the hostility of his enemies induced him in the same year to leave Denmark and settle in Berlin, where he published, among other works, critical biographies of Lassalle (1877); Esaias Tegnér (1878), and Lord Beaconsfield (1879). Then a lecture tour through Norway and Denmark brought a powerful party to his side, and in 1882 he returned to Copenhagen, his countrymen having guaranteed him an income of $1,000, with the one stipulation that he should deliver public lectures on literature. Among his later works are ‹Den Romantiske Skole i Frankrig› (1882); a biography of Ludvig Holberg (1885); a valuable study of Shakespeare, published in an English translation in 1899; ‹Impressions of Russia› (1888); ‹Poems› (1899); ‹Berlin as an Imperial Court› (1884). Brandes is not only the foremost critic of Denmark, but one of the great literary critics of his age. His works have been translated into German and also into English and French. Brandes is known as the scientific critic of literature, which he considers as a mirror of life itself. Recent works from his pen are ‹Poland› (1903); ‹Recollections of My Childhood and My Youth› (1906); ‹Erinnerungen› (1908); ‹Ferdinand Lassalle› (New York 1911).

BRANDING, a form of punishment once in use for various crimes by the Greeks and Romans and adopted by the canonists and by our Anglo-Saxon ancestors, but abolished in England in 1823. It was performed by means of a red-hot iron and the part which was branded was the cheek, the hand or some other part of the body. When the practice of arresting judgment in criminal cases by Benefit of Clergy was in force, it was customary to brand on the left thumb any layman who received this benefit, since it was not permitted to a layman to enjoy it more than once. During the reign of James I this punishment was meted out to women convicted of petty larcenies. In later legislation, under William III, it was provided that these offenders be branded on the cheek, but this barbarous custom was repealed under Anne's reign. It was also practised to some extent by the early colonists in America, but is now obsolete. Even after branding had been abolished in all other cases it was for a long time retained in the army as a punishment for desertion, the letter D being marked on the left side of a deserter two inches below the armpit. It was not, however, properly speaking, branded on his side, but marked with ink, gunpowder or some other substance which would leave a stain that could not be obliterated without destroying the skin at the part. This also has been abolished. In mercantile law the term refers to the stamping of some distinguishing mark upon manufactured articles. (See TRADE MARK). In cattle-raising districts in the United States, Australia, etc., cattle are branded with the mark of the owner. Until quite recent years incorrigible rogues were branded on the forehead in Russia with the letter B, signifying «bradyéva» — vagabond.

BRANDIS, Christian August, German philologist and historian of ancient philosophy: b. Hildesheim, 13 Feb. 1790; d. Bonn, 24 July 1867. After a course of philological and philosophical studies at Kiel and Göttingen, he was graduated at the University of Copenhagen in 1812 and for a short time delivered lectures on philosophy. He was induced by Niebuhr in 1816 to accompany him to Rome as secretary to the Prussian embassy. From 1819 to 1821 he was engaged in conjunction with Immanuel Bekker in collecting materials for a new edition of Aristotle, published in four volumes at Berlin (1831–36). In 1821 he was appointed ordinary professor of philosophy at Bonn, where he edited Aristotle's ‹Metaphysics,› Vol. I (Berlin 1823); ‹Scholia in Aristotelem› (Berlin 1836); and ‹Scholia Graeca in Aristotelis Metaphysicam› (Berlin 1837). His professional duties at this university were continued during the rest of his life, being interrupted only by a residence of three or four years in Greece, where he was acting as cabinet counsellor to King Otho. After his return from Greece he published an interesting and instructive work, for which his residence in that country had furnished him with materials, entitled ‹Mittheilungen über Griechenland› ‹Communications on Greece› (1842) and at the same time resumed his professorship at Bonn. His two most important works are his ‹Handbuch der Geschichte der griech.-röm. Philosophie› (3 vols., Berlin 1835–66); and ‹Geschichte der Entwickelungen der griech. Philosophie› (Berlin 1862–64).

BRANDIS, SIR Dietrich, English forest administrator and botanist: b. Bonn 1824; d. 29 May 1907. Educated in his native city and in Copenhagen, he was appointed superintendent of the teak forests of Pegu in Burmah in 1852. These by his energetic measures he saved from rapid depletion and was afterward given control of all the forests in the state. He was inspector-general of forests for the Indian government, 1864–83, and from 1887–96 supervised the practical continental training of English students in forestry — a scheme that was extended to include students from the United States. He was the author, among other works, of ‹Forest Flora of Northwest and Southern India› (1876); and of an exhaustive treatise on ‹Indian Trees› (1906).

BRANDON, Canada, city in Manitoba on the right bank of the Assiniboine River, 132 miles west of Winnipeg, on the Canadian Pacific, Canadian Northern and Great Northern railways. The name was given first in 1794 to Brandon House, a trading-post on the Assiniboine, 13 miles east of the present location, and also to the range of hills to the south. Brandon is the railway centre for a fertile farming country, and is the second city in size and importance in the province. It stands on the gravelly slopes of the south bank of the river and has excellent sewerage and water systems. Both the business and residential sections are well-built. Brandon College, (Baptist) and a hospital are the chief public institutions. Its manufacturing industries include a large binder-twine factory, brick and cement works, machine works and woolen, flour and saw mills. Across the valley is the Manitoba Experimental Farm, 670 acres in extent; and on the same side of the valley, the Indian industrial school, and one of the provincial asylums for the insane. Pop. 13,839.

BRANDON, Vt., township of Rutland County, 16 miles northwest of Rutland and 183 miles from Boston, on the Rutland Railroad, near Otter Creek, 16 miles from Lake Champlain. It is in the midst of a fertile farming section, noted for its horses, stock and dairy farms, the principal crops being hay, potatoes, corn and oats; while the picturesquesness of the environing country make it an attractive residence and summer-resort. It contains an academy, two parks, a fine hotel and private residences, a town-hall, good graded and district schools, a public library and five churches. There are two national banks, with combined resources of $695,291; an assessed property valuation at 1 per cent between $19,000 and $20,000; a marble mill and quarries, woodworking plant, pasteurizing milk station and a tub factory. Pop. (1920) 1,631.

BRANDT, Heinrich von, Prussian general and military author: b. Lakin, West Prussia, 1789; d. 1868. He studied law in Berlin, but joined the army in 1807; fought in the Spanish and Russian campaigns, and was wounded and captured by the Russians at the battle of Leipzig. He was made a member of the general staff of the Prussian army, took part in the Polish revolts of 1831 and 1848, and with the rank of general of infantry retired from the army in 1857. He had been elected a member of the Prussian Upper Chamber in 1849 and of the Erfurt Parliament in 1850. His fame is perpetuated by his books, chief of which are ‹Geschichte des Kriegswesens› (Berlin 1830–35); ‹Grundzüge der Taktik der drei Waffen› (1883); ‹Der kleine Krieg (2d ed., 1850). Consult his biography by his son, ‹Aus dem Leben des General Brandt› (2 vols., Berlin 1882).

BRANDT, Hermann Carl George, German-American educator: b. Vilsen, Germany, 15 Dec. 1850. He was graduated from Hamilton College, Clinton, N. Y., in 1872; was instructor there (1874–76); associate professor of German at Johns Hopkins University (1876–82), and since 1883 professor of German at Hamilton. He has published a ‹German-English and English-German Dictionary› (1879); ‹German Grammar› (1884); a ‹German Reader› (1889), and an edition of Lessing's ‹Nathan der Weise›; ‹German Science Reader› (1897).

BRANDT, Josef von, Polish painter: b. Szczebrzeszyn, 11 Feb. 1841. He first studied engineering in Paris, then took up painting at Munich as a pupil of Franz Adam and Karl Piloty and opened his own studio. His pictures mostly illustrate the soldier life of the 17th century, though he has painted also some excellent pictures of Polish peasant life. His works include ‹Polish Peasants at the Inn,› ‹Episode of the Thirty Years' War,› ‹The Battle with the Turks, near Vienna, 12 Sept. 1683,› ‹Cossack Camp,› ‹Tartar Battle,› ‹Cossacks on the March,› ‹Cossacks' Triumphal Song› and ‹Defense of a Farmyard by Polish Cavalry,› and ‹The Runaway,› which in 1900 received a prize in the National Academy, New York.

BRANDT, Nicholas, German chemist of the 17th century, usually considered the discoverer of phosphorus. Leibnitz mentions him as a chemist of Hamburg, who, during a course of experiments on urine, for the purpose of discovering a solvent which would convert silver into gold, accidentally produced phosphorus, in 1667 or 1669. He communicated or sold his discovery to Kunkel, who showed it to Leibnitz. Boyle, securing a piece of the phosphorus, and knowing from what material it had been obtained, after various experiments succeeded in preparing it and thus made an independent discovery of the method.

BRANDY, the name commonly applied to the spirit distilled from the juice of the grape, but also given to liquors distilled from other fruits, such as apples, cherries, peaches, etc. All these brandies differ from each other only in the essential oil which they contain and which gives to each its different flavor and aroma. The alcohol in brandy generally constitutes 50 per cent of the whole, the remaining substances being water, amyl, propyl and isobutyl, alcohols, glycerol, etc. A brandy highly esteemed is Cognac, exported from southwestern France, and obtained by distilling white wines of the finest quality. An inferior kind of spirit is frequently prepared from the «marc» of grapes and the refuse of wine vats. When first distilled it is as colorless as alcohol, and continues so if kept in bottles or jars. When stored in casks, however, it acquires from the wood a pale amber tint, and in this state is sold as pale brandy. The dark color of brown brandy is produced artificially, to please the public taste, by means of a solution of caramel, and this is frequently added in excess to give a rich appearance to a brandy of low quality. A large proportion of the brandy sold in the United States is simply raw grain spirits flavored and colored. The spirit is imported into France, where it is redistilled and converted into French brandy. Brandy improves in flavor by being kept but loses in strength. Of late years the development of viticulture in the western States, particularly in California, has enabled American enterprise to produce a brandy that is a formidable rival to the French article. Imitation brandy is prepared either by flavoring highly rectified spirit with essence of Cognac or by distilling the spirit with bruised prunes, acetic ether, argol and a little genuine brandy and adding to the distilled spirit tincture of catechu and spirit coloring. See ALCOHOL; BEVERAGES; DISTILLED LIQUORS; LIQUORS.

BRANDY STATION, Va., a village of Culpeper County, 56 miles southwest of Alexandria, notable as the scene of several minor battles during the Civil War. The earliest, on 20 Aug. 1862, was distinguished by a fierce cavalry charge on the Federal side; the second, 9 June 1863, resulted in the defeat of the Federal cavalry under Generals Buford and Pleasanton by the Confederate commander Stuart. (See FLEETWOOD, or BRANDY STATION, BATTLE OF). Other battles were fought near here 13 Sept. 1863; 11 Oct. 1863; and there were also several skirmishes here. That of 9 June 1863 is also known as the battle of Beverly's Ford.

BRANDYWINE, Battle of the, in the American Revolution. After the battle of Princeton (q.v.), the American and British armies retained their respective positions until early summer of 1777, employing the interim in foraging and plundering expeditions and in recruiting their forces. Finally, in June, Howe left New Brunswick and evacuated the Jerseys, but in July set sail from New York in a fleet and late in August landed at the head of the Elk River, with the intent of making a direct descent on Philadelphia. As the British advanced Washington retreated across Brandywine Creek, which flows into the Delaware at Wilmington, taking post opposite Chad's Ford. On 11 Sept. 1777 the British advanced in two columns, the right under Knyphausen and the left under Cornwallis. While the former engaged in an artillery duel with the Americans at the forks of the creek, Cornwallis crossed above the forks, attacked Sullivan's troops at Birmingham Church, near Dilworth, and forced them to retire. Washington sent Greene's brigades to support Sullivan but Greene found Sullivan in full flight and could only cover the retreat. Meanwhile Knyphausen attacked Wayne at Chad's Ford and drove his troops back in disorderly flight. Hence Washington retreated to Chester and the next morning to Philadelphia, unmolested by the British, who were too weary to continue the pursuit. The American loss was 300 killed, 600 wounded (among them Lafayette) and 400 prisoners, while the British loss was not more than 600 killed and wounded. Consult Stone, W. D., ‘The Battle of Brandywine’; Fisher, S. G., ‘Struggle for American Independence’ (Vol. II, pp. 10–29); Carrington, H. B., ‘Battles of the Revolution’; Gordon, William, ‘American Revolution’ (Vol. II); Stedman, Charles, ‘American War’ (Vol. I); Trevelyan, Sir George Otto, ‘American Revolution’ (Vol. IV); Tower, Charlemagne, ‘Marquis de la Fayette in the American Revolution’; Lossing, ‘Field-Book of the Revolution’ (Vol. II); Lowell, E. J., ‘Hessians in the Revolution’; Stillé, C. J., ‘Wayne and the Pennsylvania Line’; Wiley and Rines, ‘The United States’ (Vol. III, pp. 52–58); and biographies of Washington, Greene, Knox, Morgan, Reed and others engaged.

BRANDYWINE CREEK, a small river of Pennsylvania and Delaware, formed of two forks, the east and the west, which effect a junction in Chester County of the first-named State and, taking a southeasterly course, empty into Christiana Creek two miles below Wilmington.

BRANFORD, Conn., borough in a township of the same name of New Haven County, situated on Long Island Sound and on the New York, N. H. & H. Railroad, about seven miles southeast of New Haven. The harbor admits small vessels. The oyster-beds of Branford form an important industrial feature. Among other occupations are the quarrying of granite, fruit raising and the manufacture of locks and iron-fittings. The Blackstone Memorial Library, one of the most notable of the smaller American public library buildings, is located here. The place is picturesquely situated and is a popular summer resort. The town of Branford, originally called Totoket, and deriving its present name from Brentford, England, was settled in 1644 by colonists from Wethersfield, Conn., augmented some years later by families from Southampton, L. I., under the leadership of the Rev. Abraham Pierson; in 1667 a large number of the inhabitants removed to New Jersey, settling at Newark. The borough was incorporated in 1893. Pop. township, 6,047; borough, 3,000. Consult Rockey, J. L., ‘History of New Haven County’ (New York 1892).

BRANGWAINE, the name of the nurse of Yseult in the legend of Tristan. The name appears as Brangane in Wagner's opera ‘Tristan und Isolde.’

BRANGWYN, Frank, English painter and illustrator: b. Bruges, Belgium, 13 May 1867. In 1877 he returned to London, where he studied art under William Morris and subsequently traveled extensively in Asia Minor and the Near East. He has been a leader in the modern reaction toward color, painting with a truly Eastern gorgeousness and is regarded as one of the most individual products of British contemporary art. His etchings, like his paintings, bold and sharp in their contrasts, are conceived in surfaces and not in lines. His paintings include ‘The Baptism of Christ’ (Stuttgart); ‘Sailor's Funeral’ (Glasgow); ‘Venetian Funeral’ (Leeds); ‘Buccaneers’; ‘Convict Ship’; ‘Moorish Goatherds’; ‘Gold, Frankincense and Myrrh’; ‘The Miraculous Draught of Fishes’; ‘Moorish Market Place by the Shore’ (now in the Luxembourg); ‘Mars and Venus’ (Dublin). His mural paintings include ‘Modern Commerce’ (Royal Exchange); and ‘King John Signing the Magna Charta’ (courthouse at Cleveland, Ohio). His etchings best known are ‘Old Houses, Ghent’; ‘London Bridge’; ‘The Sawyers’; ‘The Building of Kensington Museum’; and ‘The Paper Mill.’ An exhibition of his etchings was held in the Public Library of New York in 1914. He received a gold medal at Chicago for ‘The Convict Ship.’ He was commissioned to decorate the East Pavilion at the Panama Exposition of 1915 at San Francisco. He also served as president of the Royal Society of British Artists and is a member of the Royal Academy. See Shaw-Sparrow, ‘Frank Brangwyn and His Work’ (London 1910).

BRANICKI, brạ-nĭts'kē, **Jan Klemens,** Polish statesman: b. 1688; d. 9 Oct. 1771. In his youth he served in the French army. In 1715 he returned to Poland. He rose to the highest dignities, was an opponent of Augustus II and the zealous champion of the nobility. After the death of Augustus III he officiated as great constable and first senator of the kingdom, and stood at the head of the Republican party, but defended the privileges of the nobility. He was offered the crown by a great majority of the nobles who constituted the nation. But the party of the Czartoryskis, backed by Russia, was triumphant. Poniatowski was elected and Branicki was outlawed and escaped to Hungary. As his wife was a sister of the new king, he soon returned and recovered his dignities. He was called by the nation the last patriot, and at his funeral was performed for the last time the mediæval ceremony of the ancient chivalry, that of breaking the coat of arms and entombing it with the body of the last member of a noble line.

BRANK, an instrument formerly in use for the punishment of scolds. It consisted of an iron frame which went over the head of the offender like a common horse-bridle, and had in front an iron plate, which was inserted in the mouth, where it was fixed above the tongue and kept it perfectly quiet. Such instruments are still preserved in the Ashmodean Museum, Oxford, the National Museum of Antiquities at Edinburgh, and in other museums, municipal buildings and churches in England and Scotland.

BRANN, Henry Athanasius, American clergyman: b. Parkstown, county Meath, Ireland, 15 Aug. 1837. He came with his family to the United States in 1849, was educated at Saint Francis Xavier's College, New York, Saint Sulpice, Paris, and the American College, Rome. He was ordained priest in Rome by Cardinal Patrizzi in 1862. For two years he was professor of theology and philosophy in Seton Hall College, South Orange, N. J.; was next successively a missionary in New Jersey; director and professor at the seminary of Wheeling, W. Va.; pastor at Fort Washington, N. Y., 1870–89, and rector of Saint Agnes' Church, New York after 1890. He built a number of churches in New York city, was a member of the Union League Club and author of ‹Curious Questions›; ‹The Age of Unreason›; ‹Life of Archbishop Hughes›; ‹History of the American College, Rome›; ‹The Henry George Land Theories›; ‹The Popes, Champions of Popular Liberty›; ‹Martin Luther›; ‹The Spirituality and Immortality of the Human Soul.› He contributed to the *Catholic World,* the *Catholic Quarterly Review,* the *Messenger,* the *North American Review,* the ‹Catholic Encyclopedia,› etc.

BRANNAN, John Milton, American soldier: b. Washington, D. C., 1819; d. New York, 17 Dec. 1892. He was graduated at the United States Military Academy in 1841, and entered the 1st Artillery. During the Mexican War he took part in the battles of Cerro Gordo, Contreras and Churubusco and in the siege of Vera Cruz and the capture of the City of Mexico, where he was severely wounded. He was brevetted captain for gallantry and meritorious conduct at Contreras and Churubusco. He served against the hostile Seminoles in Florida, and at the outbreak of the Civil War commanded the forces engaged in the reduction of the Confederate works on Saint John's River, compelling the evacuation of Jacksonville. He commanded a division in the Army of the Cumberland 1863–64, taking part in the advance on Tullahoma, served through the Atlanta campaign and all its operations, and was in the battles of Hoover's Gap, Chickamauga, Missionary Ridge, Kenesaw Mountain and the siege of Atlanta. On 13 March 1865 he was brevetted major-general of volunteers for gallant and meritorious services during the war. He was stationed at various posts from 1866 until his retirement, 19 April 1882, as colonel of the 4th Artillery.

BRANNER, John Casper, American geologist: b. New Market, Tenn., 4 July 1850. He graduated at Cornell University in 1882, and in 1885 took his degree of Ph.D. at the University of Indiana. He was assistant geologist of the Imperial Geological Survey of Brazil 1875–78; special botanist for Thomas A. Edison in South America 1880–81; special agent of the United States Department of Agriculture for investigating cotton and the insects affecting it in Brazil 1882–83; topographical geologist of the Pennsylvania Geological Survey, anthracite district 1883–85; professor of geology at the University of Indiana 1885–91; State geologist of Arkansas 1887–92. In 1892 he was elected professor of geology at Leland Stanford Jr. University and was its vice-president from 1899 to 1913, when he was made its president. He retired 31 Dec. 1915 and was made president emeritus. In 1915 he was a member of the committee of the National Academy of Science to report to the President of the United States upon the landslides on the Panama Canal. He has written a large number of papers and reports on geology and physical geography, and is associate editor of the *Journal of Geology.*

BRANNON, Henry, American jurist: b. Winchester, Va., 26 Nov. 1837; d. 24 Nov. 1914. He studied law and practised his profession in West Virginia 1859–81, becoming circuit judge in 1880, and judge of the State Supreme Court in 1888. He published ‹Treatise On Rights and Privileges Under the 14th Amendment to the Constitution of the United States.›

BRANT, Joseph (THAYENDANEGEA), Mohawk chief: b. Ohio, about 1742; d. 24 Nov. 1807. He was sent by Sir William Johnson to a school at Lebanon, Conn., from which grew Dartmouth College. Joining the Episcopal Church, he taught religion to the Mohawk Indians, translating into their language parts of the New Testament and the Prayer Book. His services against Pontiac and in the French and Indian War were highly valued. After the death of Sir William Johnson (who had married his sister Molly), Brant became, in 1774, secretary to Guy Johnson, superintendent of Indian affairs, and when the American Revolution began he incited the Indians against the colonies. His presence at the massacre of Wyoming is authoritatively disproved, but he took part in that of Cherry Valley and in other savage engagements. He was received with great distinction on his tour to England in 1786 and was attached to the military service of Sir Guy Carleton in Canada. He opposed the confederation of the Indians which led to the expedition of General Wayne, and did all he could to prevent peace between the Indians and the United States. He was zealously devoted to the welfare of his own people, a brave warrior, loyal to his friends and merciful to his captives. In England he collected funds with which he built the first Episcopal church in Upper Canada. Brantford, Ontario, is named in his honor. One of his sons, John Brant (1794–1832), in the War of 1812, was the leader of a body of Canadians and Indians against the United States. The life of Brant was written by W. L. Stone (new ed., Albany 1865). Consult also Eggleston and Seelye, ‹Brant and Red Jacket› in ‹Famous American Indians› (New York 1879).

BRANT, bränt, or **BRANDT, Sebastian,** German poet and satirist: b. Strassburg 1457; d. there, 10 May 1521. He studied law at Basel, took the doctor's degree and delivered lectures on jurisprudence for many years. In 1501 he was state councillor at Strassburg and state recorder in 1503. Some of his writings brought him to the notice of Emperor Maximilian, who entrusted him with several important commissions in the interests of the state. He translated Virgil, Terence and other Latin writers, and wrote a number of law treatises as well as poetry, in both German and Latin. In ‹The Ship of Fools› (‹Das Narrenschiff›), first published in Basel 1494, he satirizes the vices and follies of his age. It became immediately popular; four editions appeared in one year and it was translated into Low German, Latin, French and English. In Germany it was so esteemed that the celebrated preacher, Geiler of Kaisersburg, delivered public lectures on it from the pulpit at Strassburg. Later editions have been printed, of which the best are by Zarncke (1854) and by Goedecke (1872). Its influence was never considerable on the literature of Germany and of other Germanic countries. The English translations are by Alexander Barclay (1509) and by Henry Watson, the latter reprinted in 1874.

BRANT, a small wild goose of the genus *Branta.* The most familiar species, the «common brant» (*Branta bernicla*) is found widely distributed throughout the United States. Its plumage, chin and cheeks are glossy black, fading into gray at the sides, with its under parts entirely white and white streaks on the sides of the neck. In its markings it is distinguished from the «black brant» (*Branta nigricans*) of the Pacific coast, which is entirely black underneath. Brants generally travel in flocks, and their comparative sluggishness enables the gunner to procure a larger number in the short time they are present than of any other sort of goose. They feed on vegetable matter, their chief food consisting of the «eel-grass,» for which they dive at low tide. The brant is chiefly a marine bird, rarely seen in the interior of the United States, and breeds in the far North, well within the Arctic Circle. Its nest is made on the ground from grass, mosses, etc., and its four eggs are dirty white in color. The name is sometimes given to other species of goose, as, for instance, the «snow goose» which is sometimes termed «white brant» because of its similarity in size. See GEESE.

BRANT-BIRD, or **BEACH-ROBIN**, common names among American gunners for the shore-bird (*Strepsilas interpres*), called «turnstone» by British sportsmen and in most books, because of its habit of moving aside pebbles in order to get at the beach-fleas and other small creatures hiding beneath them, upon which it feeds. It also feeds upon the eggs of the «horsefoot,» or king crab, which it scratches out of the sand; hence it is known to some as «horsefoot snipe.» It stands between the plovers and sandpipers, having a comparatively short bill and legs and less active manners than most of the latter. It is, perhaps, the most beautiful of the beach-birds, having a highly variegated plumage much alike in both sexes. The bill is black, feet orange; head and sides of neck black and white with a black band across the breast; throat, lower parts and tail-coverts, white; remainder of the plumage chestnut and brown, mottled with black and set off by a white band on the wing. This is one of the most cosmopolitan of birds, wandering to all parts of the world, yet nowhere, perhaps, numerous.

BRANTFORD, Canada, city, port of entry and county-seat of Brant County, Ontario, on the Grand River at the junction of several branches of the Grand Trunk Railway, 80 miles southwest of Toronto and 60 miles east of London. It is named from the Mohawk chief, Joseph Brant (q.v.), to whose memory a colossal statue has been erected. The Grand River is navigable to within about two miles of the city and is connected therewith by a canal, affording water communication with Lake Erie. A United States consular agent is stationed here. The city is lighted by electricity and has handsome churches, schools and private buildings, a stone courthouse, hospital, house of refuge, etc. It was at Tutela Heights, near the city, that Alexander Graham Bell, the inventor of the telephone, made, in 1876, his first successful experiments, and a monument has been erected in celebration of the event. It is the seat of the Ontario Institution for the Education of the Blind and of Wickliffe Hall. Brantford is the trade centre of a large and fertile agricultural region. The buildings and shops of the Grand Trunk Railway occupy more than 12 acres. The manufactures comprise metal and stone ware, engines, machinery, sash and blinds, agricultural implements, felt and rubber, etc. Pop. 23,132.

BRANTÔME, brän-tōm, **Pierre de Bourdeille** (LORD OF THE ABBEY OF BRANTÔME): b. Périgord, Gascony, about 1540; d. 1614. Being the younger son of a nobleman, he was destined for ecclesiastical preferment but left the Church to become a page at the court of Margaret of Navarre. In his epitaph, composed by himself, he relates in a vaunting manner how he first bore arms under the great Francis of Guise and afterward served the king, his master. He studied in Paris and was gentleman of the chamber to Charles IX. He visited Scotland as escort of Mary Stuart. He also spent some time at the courts of Henry III and Henry IV. After the death of Charles IX, he withdrew to his estates, where he wrote his memoirs, which have a great deal of vanity and self-complacency, mingled with much that is interesting. Brantôme was personally acquainted with the great characters of the time and an eye-witness of all the important events which then took place, and in some was an actor. He was a courtier, regardless of right or wrong, who does not blame the great but observes and relates their faults and crimes as ingenuously as if he were uncertain whether they deserve praise or blame; as indifferent about honor and chastity in women as about integrity in men. He places us in the middle of that century when expiring chivalry was contending with the forming and as yet unsettled manners of later times. Brantôme, in the midst of his wandering life, had acquired more learning than most of his fellow soldiers. He has left ‹Vies des grands capitaines français›; ‹Vies des grands capitaines étrangers›; ‹Vies des dames illustres,› and ‹Vies des dames galantes› (together called ‹Recueil des dames›), besides other works. All his manuscripts were collected by the Ecoles des Chartes in 1904. Consult Lalanne, ‹Brantôme, sa vie et ses écrits' (Paris 1897); Wormeley, K. P., 'Illustrious Dames of the Court of the Valois Kings' (New York 1912).

BRANTS, Victor Léopold Jacques Louis, Belgian educator and writer on economics and sociology: b. Antwerp, 23 Nov. 1856. Since 1878 he has been connected with the faculty of Louvain University, being at present professor of political economy and statistics and Belgian history. He is president of the School of Commercial, Consular and Colonial Sciences of Louvain, member of the superior council of labor and permanent secretary of the Belgian Society of Social Economy. He is corresponding member of the Institut de France and member of the Royal Academy of Belgium. His published works include 'La morale du désintéressement rationel' (1877); 'Sur l'histoire des classes rurales en Belgique jusqu'à la fin du XVIIIe siècle' (1881); 'Au pays des Ruthènes' (1889); 'Le travail du dimanche en Autriche' (1896); 'Les grandes lignes de l'économie politique' (3d ed., 1901; 5th ed., 2 vols., Louvain 1908); 'La petite industrie contemporaine' (3d ed., Paris 1912); 'Le travail de nuit des enfants en Belgique' (1906); 'La faculté de droit de l'Université de Louvain à travers cinq siècles, 1426–1906' (Louvain and Paris 1906); 'La lutte contre l'usure dans les lois modernes' (ib. 1907), and various governmental reports on economic and sociological matters. He is a contributor to *Reforme sociale* (Paris), *Revue générale* (Brussels), *Revista internazionale di scienze sociali* (Rome),

BRASHEAR, brăsh'ēr, **John Alfred,** American astronomer and manufacturer of scientific instruments: b. Brownsville, Pa. in 1840; d. Pittsburgh, Pa., 8 April 1920; educated, public schools of his native city; learned machinist's trade and was a mechanical engineer from 1860 to 1870. In the latter year he began the construction of astronomical and physical instruments, and was actively engaged in the construction and manufacture of same after 1880. He received the degree of D.Sc. from the Western University of Pennsylvania and from Princeton in 1911; the degree of LL.D. from University of Wooster 1896, and from Washington and Jefferson; and D.Eng. from Stevens Institute of Technology in 1912. He was acting director of the Allegheny Observatory 1898–1900, and was acting chancellor of the Western University of Pennsylvania. He was a fellow of the Royal Astronomical Society of Great Britain, of the British Astronomical Association, of the Société astronomique de France, the Société Belge d'Astronomie and the Astronomical Society of America; also honorary member of the American Society of Mechanical Engineers and the Royal Astronomical Society of Canada.

BRASHEAR CITY. See MORGAN CITY.

BRASHER, Abraham, American army officer: b. New York, 22 Dec. 1734; died in exile during the Revolution, in 1782. He was one of the most active associates of the "liberty boys" of his native city. He wrote many of the popular ballads of the Revolutionary period, and was a constant contributor to the newspapers of his day. Among his poetical productions were 'Another New Year's Address,' and the 'General's Trips to Morristown,' both of which were favorites in the American camp.

BRASIDAS, Spartan general who distinguished himself in the first half of the Peloponnesian War by his courage and his military skill: d. 422 B. C. He first distinguished himself by repelling the attack of the Athenians on the fortress of Methone (431 B.C.). In 429 he was sent to assist Cnemus and participated in the unsuccessful attack on the Piræus; in 427 accompanied the admiral Alcidas to Corcyra; in 425 was severely wounded in the assault on Pylos; and subsequently was elected by his fellow-countrymen to be the leader of an expedition intended to carry the war into Thrace. In 424 he relieved Megara, and passing through Thessaly effected a junction with Perdiccas of Macedon. Within a short time he had gained possession of Arrhibæus, Acanthus, Stagira, Amphipolis, Torone and Scione. In 423 a truce was agreed upon, and in the same year Mende revolted and Brasidas immediately seized the town. The Athenians had, however, sent a new armament into the field consisting of two armies, and Brasidas, receiving no reinforcements from Sparta, was later forced to surrender the town to one of these armies. Cleon, the leader of the second army, allowed himself to be drawn into a battle at Amphipolis, and was totally defeated, he himself being in the number of the slain. But the Spartan victory was purchased with the loss of their general, who received a fatal wound during the engagement. Brasidas was buried at Amphipolis, within the walls, and long after his death his memory was honored as that of a hero, by the celebration of yearly sacrifices and games. The Greek writers speak highly of Brasidas. Thucydides notices his eloquence, unusual in a Spartan, his justice, liberality and wisdom, while Plato compares him to Achilles; but circumstances show that he was endowed with as much Spartan duplicity as Spartan courage.

BRASS, Sally, in Dickens' 'Old Curiosity Shop,' an evil and cruel woman who was her brother's law partner and assisted him in carrying out his schemes.

BRASS, Sampson, in Dickens' 'Old Curiosity Shop,' an attorney of evil reputation, whom Quilp uses as a tool.

BRASS. The quality of brass depends upon the proportions of its two constituents, copper and zinc. The greater the quantity of zinc the lighter the color and the more brittle and springy the alloy, while, on the other hand, the greater the quantity of copper, the redder the color and the tougher but softer the alloy. Technically, the term brass is extended to include compounds of copper and tin, as in brass ordnance, the brasses or bearings of machinery, etc.; but such alloys of copper and tin, though styled hard brass, are more strictly varieties of bronze. Brass foil, frequently not more than 1-50,000 of an inch in thickness and known as Dutch leaf, is made by beating out sheets of very thin brass containing a large proportion of copper. Copper and zinc alloys resembling brass are well known in the trade as gilding metal, Mannheim gold, pinchbeck, bath metal, Bristol brass, Muntz sheathing metal, spelter solder and mosaic gold.

In the manufacture of brass, either of two processes may be followed. The direct method is to fuse the zinc in a crucible and gradually add the copper in pieces. But this process is attended with disadvantage, owing to the volatile and oxidizable nature of zinc. The indirect method of forming brass is generally followed; it consists in heating in crucibles or pots a mixture of calamine (carbonate of zinc), charcoal and thin pieces of scrap or grain copper. For ordinary purposes brass is first cast into plates of about 100 pounds weight (¼ to ½ inch thick) which can be readily broken up, remelted and cast in a mold of any desirable shape or size.

The following are the usual proportions in the several varieties of brass: Red brass — 4 parts copper to 1 part zinc; yellow brass — 2 parts copper to 1 part zinc; Muntz metal — 3 parts copper to 2 parts zinc; Spelter solder — 1 part copper to 1 part zinc. For brass wire the mixture generally used is five parts copper to three parts zinc, but the proportions vary greatly according to the purpose for which the wire is to be used. For some purposes, such as the manufacture of pins, where rigidity is of more importance than toughness, and cheapness is essential, it is possible to use Muntz metal, while for drawing into very fine gauges and weaving into the gauze that is used largely in paper-making machinery, much richer grades are employed.

The alloying of copper and spelter is performed in crucibles, generally made 16 inches in depth and 10 inches in diameter at the top, tapering to about 9 inches in diameter at the bottom, the thickness of the walls being about one inch. These crucibles are heated in «wind furnaces.» This furnace is fired with solid fuel and has a natural draft, the height of the chimney stacks varying from 40 feet, where each furnace has its separate stack, to 150 feet where a number of furnaces are connected to one stack. Gas furnaces are also used in combination with generators, in which case producer gas, or sometimes water gas, is burned in place of the solid fuel; in these it is usual to heat 10 or 12 crucibles in one furnace or chamber. Reverberatory and tilting furnaces are employed for large castings in sand molds, but for casting ingots in metal molds it is usual to employ a crucible furnace of the «wind furnace» type, the fuel commonly used being coke. Tilting furnaces are largely used in America. The oldest method of making brass, still largely used, is as follows: The metal is cast into long narrow ingots of about 1 cwt. each and from 3 to 4 inches wide. The molds are generally made of cast-iron, cast in halves, which are clamped together with wrought-iron rings. The molds are placed below the surface of the floor of the casting shop and are supported against the side of the pit at an angle of about 60 degrees. Boards are placed across for the caster to stand upon while pouring the metal from the crucible into the mold. The metal, after careful skimming, is poured into the mold at the top and when it has set the rings are slipped off the mold and the upper half removed, leaving the casting or ingot exposed. Before the metal is poured into the mold the inside of the mold is well brushed and dressed with resin and cotton-seed oil to prevent adhesion, or carbon in a fine state and whale oil are used, which give the mold an even surface. The ingots are next rolled when cold between ordinary flat rolls until the desired thickness is obtained.

The best process of *slitting* commonly employed in America for grades of brass which can only be rolled cold, consists of casting the brass in the form of long bars, either square or round, from 1¼ to 1½ inches thick. Each of these bars is rolled down separately in the cold state into a rod about ⅜ inch in diameter, or sometimes less, which is afterward drawn into wire. Pieces weighing from 60 pounds to 70 pounds can thus be obtained. The advantage of this process over the old one is that longer lengths are obtained and labor in the drawing is to some extent saved. A process brought out some years ago in the north of England consisted in casting in a centrifugal mold about 18 inches in diameter and mounted on a vertical axis revolving at a high speed, so as to produce a casting in the form of a hoop. This was rolled down in open-ended rolls brought together with hydraulic pressure and working in the same manner as those used for rolling out the tires for locomotives and other railway stock. A large thin hoop about three inches wide resulted, which was then cut in circular shears helically, forming a long strip, and this was drawn in the usual way. The great advantage of this method lay in the fact that a heavy piece was obtained, at the same time having a small section ready for drawing. In France a method often employed of making the «slittings» is to roll the metal down into large sheets, which are cut into strips spirally. Another method tried in America consists in casting a solid billet, which is pierced with a suitably constructed mandril to form a cylinder, which is afterward cut up helically and drawn in the usual way.

In recent years continuous drawing machines have come very much into use. With these machines, instead of winding the wire on to a block after drawing through one die at a time, the wire is drawn through one die, then wound two or three times round a block and taken through another die, and so on, the friction on each drum being sufficient to carry the wire forward and the circumferential speed of the drums being varied to suit the elongation of the wire. Owing, however, to brass being very quickly hardened by drawing, it is not possible to carry on this process *ad infinitum* unless the wire be annealed periodically. When once it has been annealed it is possible to effect a very large reduction at one draught, the actual amount varying with the composition of the brass, the larger the proportion of copper the greater the reduction at one draught. See Copper and Brass Industry.

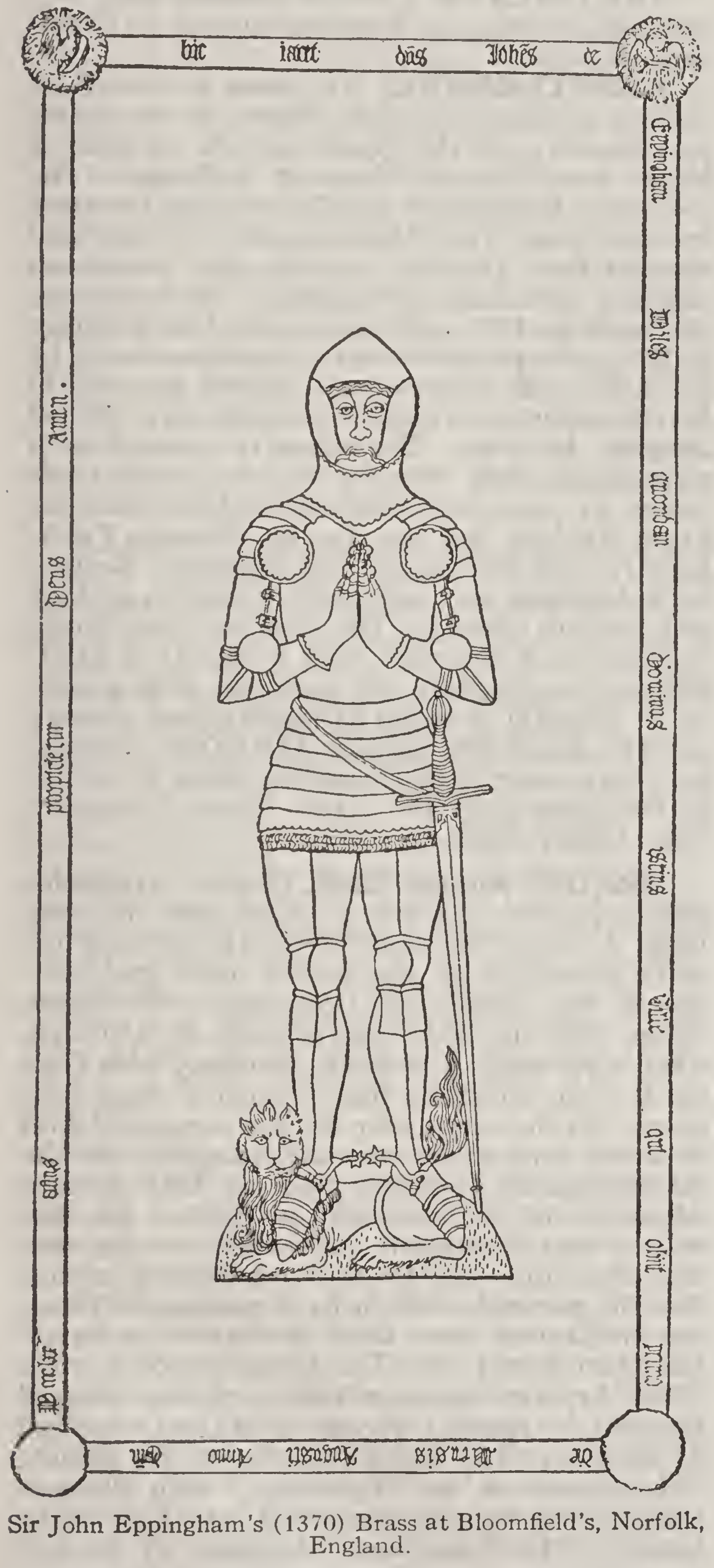
The following table shows the weight in pounds of sheet brass of various thicknesses:

Thickness in inches	Weight of sheets per square foot	Thickness in inches	Weight of sheets per square foot
1/16	2.7	1 1/16	45.95
1/8	5.41	1/8	48.69
3/16	8.12	3/16	51.4
1/4	10.76	1/4	54.18
5/16	13.48	5/16	56.85
3/8	16.25	3/8	59.55
7/16	19.	7/16	62.25
1/2	21.65	1/2	65.
9/16	24.3	9/16	67.75
5/8	27.12	5/8	70.35
11/16	29.77	11/16	73.
3/4	32.46	3/4	75.86
13/16	35.18	13/16	78.55
7/8	37.85	7/8	81.25
15/16	40.55	15/16	84.
1	43.29	2	86.75

BRASS AND BRONZE WORK. See Bronze and Brass Work.

BRASSARTS, or **BRASSARDS,** jointed plates of steel, protecting the upper arm from the shoulder, which were covered by pauldrons, to the elbows, where they were met by the gauntlets. These pieces of armor were not used in the chivalric ages, or in full suits of knightly armor, but in the half armor worn during the wars of Gustavus Adolphus, Wallenstein and the Low Countries, in the times of Cromwell, when plate armor was going out of use.

BRASSES, called also monumental brasses and sepulchral brasses. From the 13th to the 18th century a certain method of decorating graves of European dignitaries consisted of inlaying the horizontal upper stone slab with a thick plate of metal called *latten,* a species of hard brass. The metal had incised inscriptions (epitaphs), usually on the border. The main decoration of the metal, however, consisted of an engraved depiction of the person interned, giving a minute graphic depiction of the costume, armor, etc., the deceased wore on state occasions. Connoisseurs and antiquarians are greatly indebted to these metal engravings for the accurate knowledge they convey as to the costume during the different historical periods of leading members of society.



Sir John Eppingham's (1370) Brass at Bloomfield's, Norfolk, England.

Experts classify brasses under the following denominations: Monastic brasses, palimpsest brasses, bedstead brasses, heart brasses, canopies, etc. As their terms imply, the engraved depictions consist of the following classes: Monks, friars, abbotts, priors, vowesses are on the monastic monuments. Some brasses have been inverted, after years of usage, and the effigy of a later interred person has been engraved on the opposite surface. These are palimpsests. «Bedstead» brasses are those dedicated to women who died in childbirth and depict a bedstead, also the infant. Some brasses are shaped in the form of a conventional heart; they commemorate the interment of the deceased's heart alone. Certain brasses frame the effigy in a «tabernacle» or canopy supported by tall, slender shafts.

Monumental brasses, so common in the different periods, have since suffered at the hands of fanatics and ignorant mobs, so much so as to be already extinct almost in France and rare in Germany. English churches, with records of 150,000, recently had but 4,000 surviving and these rapidly disappearing.

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BRASSEUR DE BOURBOURG, bra̧-sėr dė boor-boor, **Charles Etienne,** French writer on American history, archæology and ethnology: b. 1814; d. 1874. He entered the priesthood, was sent to North America by the Propaganda and lived and traveled here and in Central America for a number of years, partly in the performance of ecclesiastical functions. Among his works are ‹Histoire du Canada,› ‹Histoire des nations civilisées du Mexique et de l'Amérique Centrale,› ‹Gramatica de la Lengua Quiche,› ‹Monuments anciens du Mexique,› ‹Études sur le système graphique et la langue des Mayas.›

BRASSEY, Thomas, English engineer and railroad contractor: b. Baerton, Cheshire, 7 Nov. 1805; d. Hastings, 8 Dec. 1870. After receiving an ordinary education he was, at the age of 16 years, apprenticed to a surveyor, whom he succeded in business. After building parts of the Grand Junction and the London and Southampton railways, he contracted, in 1840, in partnership with another, to build the railway from Paris to Rouen. In a few years he held under contract, in England and France, some 10 railways, involving a capital of $180,000,000 and employing 75,000 men. In partnership with Betts and Peto he undertook the Grand Trunk of Canada, 1,100 miles in length, including the great bridge at Montreal. His army of men were employed in nearly every part of Europe, South America, Australia, India, etc. He amassed great wealth, but continued to be generous to the needy and modest and simple in his tastes and manners. Sir Arthur Helps wrote his ‘Life’ (London 1872).

BRASSEY, Thomas, Earl, English politician, 1st Baron of Brassey: b. Stafford, 11 Feb. 1836; d. London, 23 Mar. 1918. He was educated at Rugby and University College, Oxford, and entered Parliament for Devonport in 1865, subsequently sitting for Hastings 1868–85. He served as civil lord of the Admiralty 1880–84 and was secretary to the Admiralty in 1884–85. In 1886 he was elevated to the peerage as Baron Brassey and was created an earl in 1911. From 1895 to 1900 he was governor of Victoria. He was an expert yachtsman, held a board of trade master's certificate and traveled over 400,000 knots in his yacht *Sunbeam.* He published ‘Work and Wages’ (1872); ‘The British Navy’ (1881–83); ‘Foreign Work and British Wages’ (1879); ‘Sixty Years of Progress’ (1904).

BRASSICACEÆ (often known also as *Cruciferæ*), a large family of dicotyledonous plants, the mustard family, consisting of herbs and a few low shrubs with pungent and stimulating but not poisonous properties. The flowers have four usually deciduous sepals and four regular, hypogynous petals arranged in such a way as to suggest the form of a cross. Of the six stamens two are shorter than the others and have a lower insertion. The fruit is a two-celled pod, known in its long form as a silique, in its short form as a silicle or pouch and, when articulated and separating at the joints, as a loment. The seeds are without albumen; leaves alternate and exstipulate. The characters of the genera depend upon the pods and seeds. There are about 215 genera and about 2,000 species of these plants dispersed throughout the temperate regions of the globe. They are most abundant in Europe and Asia Minor. Many useful vegetables belong to this family, such as the cabbage, cauliflower, kale, Brussels sprouts, broccoli and kohlrabi, the various kinds of turnip and the radish. The horseradish (*Armoracia armoracia*) has long been known as a condiment. The watercress introduced from Europe now grows wild in America. The seeds of the white mustard (*Brassica alba*) and the black mustard (*B. nigra*) are ground for use as a condiment and also for medicinal purposes. Various well-known ornamental flowers belong to the family, such as the wall-flower, the stock, the rocket candytuft, sweet alyssum, honesty, etc. The curious plant known as the rose-of-Jericho or resurrection-plant (q.v.) is also a member of this family.

BRATIANU, brä-tē-än′ẹ, or **BRATIANO, Ion,** Rumanian statesman: b. Pitesci, Wallachia, 2 June 1821; d. 16 May 1891. He studied in Paris and on his return to Bucharest was active in the revolution of 1848, which led to the overthrow of the Hospodar, George Bibesco. Strenuous in his efforts to establish Rumania as an independent kingdom, when Russia and Turkey intervened, he and others were imprisoned and exiled. He lived in Paris until the Treaty of Paris (1856) had adjusted the troubles of the Danubian principalities. In 1866, when Prince Charles of Hohenzollern became King of Rumania, Bratianu was appointed Minister of State but resigned in 1868. From 1876 to 1888 Bratianu was leader of a Liberal cabinet, which on 21 May 1877 proclaimed the independence of Rumania and effected its establishment as an independent kingdom 26 March 1881. He resigned as president of the ministry in 1888. He was author of ‘Mémoire sur l'empire d'Autriche dans la question d'Orient’ (1885); ‘Reflexions sur la situation’ (1856); ‘Mémoire sur la situation de la Moldavie depuis le traité de Paris’ (1857), and ‘La Question religieuse en Roumanie’ (1886).

BRATISLAVA, Czecho-Slovakia, until 1919 the name of the city formerly known as Pressburg (q.v.).

BRATTLEBORO, Vt., town in Windham County on the Connecticut River, in the southeastern part of the State, on the Boston & Maine and Central Vermont railways. The town was first settled in 1724 at Fort Dummer by a garrison from Massachusetts. The settlement at Fort Dummer was the first permanent civilized settlement in Vermont. The town was chartered in 1753 and incorporated as a village in 1832. Its present form of government is by a board of three selectmen elected annually in March and three village commissioners, elected annually in May. The town is situated in a picturesque, rich farming region; is the trade centre of southeast Vermont and contains the State Asylum for the Insane, Brooks Public Library and has many fine churches, Brattleboro Academy and an excellent system of high and graded schools. The city has four banks and one trust company, with a capital of $100,000, surplus $56,000; two national, with a capital of $300,000, deposits $3,500,000; two savings, deposits $6,500,000, surplus $2,000,000. Brattleboro has many manufactories, chief of which is the factory of the Estey Organ Company. Pop. (1920) 7,324.

BRAUN, August Emil, German archæologist and writer on art: b. Karlsruhe, 19 Aug. 1809; d. Rome, 12 Sept. 1856. He received his early education at his native town and continued his studies at Göttingen and Berlin. From 1832 to 1833 he resided at Dresden, whence he went to Rome in company with Gerhard, with whom he had formed a close intimacy. In the same year he was appointed first librarian and then assistant secretary to the Archæological Institute, and in 1834 became editor of the *Bulletino* and in 1837 of the *Annali* of that institution. His views on the subject of religion and art are summarized in this, that the principles which have permeated Western civilization have their derivation in Egypt. His chief works are ‘The Judgment of Paris’; ‘The Artistic Representations of the Winged Bacchus’; ‘Ancient Works in Marble,’ 1st and 2d decades; ‘The Greek Doctrine of the Gods’; ‘The School of Art Mythology,’ with 100 copperplate engravings, translated into English by Grant; ‘The Ruins and Museums of Rome,’ constituting an excellent guidebook for artists and antiquarians.

BRAUN, Ferdinand, German physicist and wireless telegraph specialist: b. Fulda 1856.

After studies at Fulda, Marburg and at Berlin, where in 1872 he gained the degree of Ph.D., he filled positions at Würzburg, Marburg, Strassburg and at Tübingen, where he was professor of physics for 10 years. He became director of the Physical Institute and professor of physics at the University of Strassburg in 1895, refusing later a request to succeed the late Gustav Wiedemann at Leipzig. His experiments in electricity led to many notable improvements in radio-telegraphy, chief of which were a method for increasing at will the power of the sending station and a method by the arrangement of the antennæ to gain control of the direction of effective radiation. He received the Nobel Prize for physics, with Marconi, in 1909.

BRAUN, Julius, German archæologist, lecturer and author: b. Karlsruhe 1825; d. Munich 1869. After studies at Heidelberg and Berlin, he became a lecturer in the University of Heidelberg, at Tübingen and lastly at Munich in the Academy of Arts. His books based on his lectures include ‹Studien und Skizzen aus den Ländern der alten Kultur› (1854); ‹Naturgeschichte der Sage› (1865); ‹Historische Landschaften› (1867); ‹Gemälde der mohammedanischen Welt› (1870); ‹Geschichte der Kunst in ihrem Entwicklungsgange, etc.› (1873), in which he contends that the Germanic and other northern races derived the fundamental principles of art and religion through Semitic, Greek and Roman channels from early Egyptian sources.

BRAUN, Karl, German liberal leader and author: b. Hadamar, Nassau, 1822; d. 1893. His early studies included classical philology and history at Marburg, and law and political economy at Göttingen. In 1859, as one of the founders, he was elected permanent president of the *Volkswirtschaftlicher Kongress;* from 1859 to 1866 was president of the Nassau Chamber of Deputies, and in 1863 founded the *Vierteljahrschrift für Volkswirtschaft und Kulturgeschichte,* which he edited until 1887. Elected to the Reichstag as deputy, he associated himself with the National Liberal, Secessionist and German Liberal parties, which advocated German unity and industrial freedom. A prolific writer, his best known works are ‹Bilder aus der deutschen Kleinstaaterei› (5 vols., 3d ed., 1881); ‹Mordgeschichten› (2 vols., 1874); ‹Eine turkische Reise› (3 vols., 1876–78).

BRAUN, Louis, German war painter: b. Schwäbisch Hall, Würtemberg 1836. His teachers were his brother and Bernard Nelser in Munich and Horace Vernet in Paris. He saw active service in the war with Denmark in 1864; the Austro-Prussian War of 1866; and the Franco-German War of 1870–71, and his experiences were reflected in his works notably in his panoramas of the ‹Battle of Sedan,› the ‹Battle of Mars La Tour› and the ‹Battle of Lützen.› Among his other works are ‹Entrance of the Germans into Orleans›; ‹The Germans in Versailles›; ‹Entry of the German Army into Paris› and the ‹Panorama of the German Colonies.›

BRAUNSBERG, Prussia, town in the province of eastern Prussia, and government of Königsberg, on the Passarge, about four miles from its junction with the Frisches Haff. It is the residence of the bishop of Ermeland, and has a Roman Catholic Lyceum, a gymnasium, a seminary for priests, a normal school; and manufactures of linen, woolens, soap, felt, yeast and leather; and a good trade in flax and grain. Steamers ply regularly to Pillau and Königsberg. Braunsberg was founded by the Teutonic Knights in 1250, and came under Prussian rule on the first partition of Poland in 1772. Pop. about 14,000.

BRAURONIA, (1) a name sometimes given to the Greek goddess, Artemis, from her shrine at Brauron, Attica; (2) a Greek festival in honor of Artemis held every four years at Brauron, in which every Attic woman must take part, before she could marry. The rites were performed by girls from 5 to 10 years old, and a part of the ceremony consisted in their imitation of the actions of bears.

BRAUWER, brou'ėr, or **BROUWER, Adrian,** Dutch painter: b. Haarlem, or Oudenarde in East Flanders, 1608; d. Antwerp 1640. He made designs of flowers and birds, which were stitched upon caps and bonnets sold by his mother, a poor woman, to the peasants. Franz Hals, a distinguished painter of Haarlem, happening to see some of these, was so struck by the talent which they evinced that he invited the young artist to receive instructions at his house, where he kept him hard at work in a garret, and appropriated to himself the proceeds of his pictures. Here Brauwer remained for many months, ignorant of the estimation in which his talent was held abroad, until by the assistance of his fellow pupil, Adrian van Ostade, he was enabled to escape to Amsterdam. The discovery of the reputation he had acquired seems to have crushed rather than incited his ambition. Perceiving the prices which his pictures commanded, and his own facility in executing them, he yielded to a natural taste for gross pleasures, and painted only when it was necessary to procure money to indulge in dissipations. During the wars with Spain he started on a journey to Antwerp, but being unprovided with a passport he was imprisoned on suspicion of being a spy. The Duke d'Aremberg, a fellow prisoner, recognizing his talent, induced him to paint something. The subject was a group of soldiers playing at cards which the artist sketched from his prison window, and the picture being shown to Rubens he at once pronounced it a work of Brauwer, whose release he immediately procured, and whom from admiration of his genius he received as an inmate into his house. Brauwer's longing for his old life, however, soon induced him to leave his protector, and after a brief career of reckless dissipation he died in the public hospital of Antwerp. His coloring is good, his facility of execution remarkable and his characterization excellent; so that his composition is nearly always good. He is one of the greatest of the Dutch painters. Among his most notable works are ‹Peasants Feasting›; ‹Peasants of Moerdyck›; ‹The Smoker› (in the Louvre); ‹The Drinker›; ‹The (little) Smoker›; ‹Tavern Interior›; ‹Quarrelling Players›; ‹The Politicians›; ‹Spanish Soldiers at Dice›; ‹Haarlem Tavern Scene›; several portraits of himself and numerous brilliant landscapes. His biography by Schmidt-Degeener appeared in

Brussels in 1908. See also Bode, ‘Great Masters of Dutch and Flemish Painting’ (New York 1909).

BRAVI, brä′vę, the name formerly given in Italy, and particularly in Venice, to those who were ready to hire themselves out to perform any desperate undertaking. The word had the same signification in Spain, and both the word and the person designated by it were found in France in the reign of Louis XIII and during the minority of Louis XIV. At the end of the 15th century they are described as being armed to the teeth, with an arquebuse in their hands, a cutlass at their side, masked by a bushy beard and enormous moustaches, and wearing a long and thick forelock called a *ciuffo,* which they used to bring down over their face when they wished to conceal it entirely.

BRAVO, Leonardo, lā-ō-när′dō brä′vō, Mexican revolutionary patriot: b. near San Luis de Potosí 1766; enlisted in the revolutionary cause, and died of prison fever, in the hands of the Spaniards, in the City of Mexico, in 1812.

BRAVO, brä′vō, **Nicholas,** Mexican statesman: b. Chilpanzingo 1790; d. 22 April 1854. He participated in the revolution against Spain (1810–21), and later aided Iturbide in establishing a republic, and supported him until 18 May 1822, when Iturbide proclaimed himself emperor. To this step Bravo was opposed, and he contributed in no small degree to Iturbide's deposition. He again became a member of the provisional government from 1 April 1822 till 10 Oct. 1824, when the Federal constitution took effect, under which he was elected to be Vice-President until 1 April 1829, Guadalupe Vittoria being President. Politicians of Mexico had now become involved in a controversy in which the order of free masons, divided into two parties, one known as the *Escoses* and the other as *Yorkinos,* contended, the one for a centralized, and the other for a Federal, form of government. Bravo was grand master of the Scotch division, and when the Federal system prevailed he became a leader of the opposition. Notwithstanding this, he had been elected Vice-President; but when, on 23 Dec. 1827, the standard of revolt was raised he became the head of the movement. The purpose of the *pronunciamiento* was to replace the actual members of the executive government with men of the *Escoses,* and to dismiss Mr. Poinsett, then United States Minister in Mexico, who was charged with too actively favoring the other party. Bravo was defeated and expelled, but was recalled in 1830 by President Bustamante, and sent by him against the insurgent, Guerrero, who was taken in arms and executed by Bravo's orders, 14 Feb. 1833. After this Bravo remained in retirement until July 1839, when, as president of the council, he was charged with the supreme administration of the government during an interim of a week. Again from 26 Oct. 1842, till March 1843, he was substituted as President in place of Santa Anna, during the latter's absence at the head of the army. For the last time he held executive power as temporary President from 29 July to 4 Aug. 1846; when he was deposed by a revolution. On the commencement of the war between Mexico and the United States, he took up arms in behalf of his country, and participated in the battle of Cerro Gordo. In the autumn of 1853 he was accused by the ministers of Santa Anna of having secretly joined Juan Alvarez in the insurrection he had set on foot; but he denied the accusation and declared he had retired from public life forever.

BRAVO-MURILLO, brä′vō-moo-rē′lyō, **Don Juan,** Spanish statesman: b. Badajoz, June 1803; d. Madrid, 11 Jan. 1873. In 1825, he entered the College of Advocates at Seville, and showed great devotion to the monarchy. When the Progressionists came into power he went to Madrid, and founded a law magazine, the *Boletin de Jurisprudencia.* With others, he also established later the conservative papers *El Porvenir* and *El Piloto.* In 1836, he became secretary of the Department of Justice under Señor Isturiz, but was proscribed after the revolution of 1840 and took refuge in France. He returned in 1843 on the downfall of Espartero and in 1847 became Minister of Trade and Public Instruction, and, in 1849–50, of Finance. In 1851 he formed a cabinet, with himself as Premier, but, in 1853, it was superseded by that of General Lersundi. The oppressive measures adopted by Bravo-Murillo and his successors led to the revolution of 1854, which caused him to leave Spain again, but he was recalled by Narváez in 1856. In 1868 he was again of the cabinet, but in the following year went with the Queen when she was forced to flee to Bayonne.

BRAVURA (brạ-voo′rạ) **AIR,** an air so composed as to enable the singer to show her skill in execution by the addition of embellishments, striking cadences, etc. It is sometimes used to denote the style of execution.

BRAXTON, Carter, signer of the Declaration of Independence: b. Newington, King and Queen County, Va., 10 Sept. 1736; d. 10 Oct. 1797. He inherited several plantations and passed the early part of his life in the enjoyment of his fortune, in his native State and in England, where he resided some years. He was educated at William and Mary College. In 1765 he took an active part in the eventful session of the house of burgesses of Virginia, in which the resolutions of Patrick Henry were adopted, and in the subsequent assemblies which were dissolved by the governor. He was next a member of the conventions which were the first step toward the substitution of popular for the royal government, and on 15 Dec. 1775 was elected delegate to the Continental Congress, as successor of Peyton Randolph, and as such affixed his name to the Declaration of Independence. He did not remain long in Congress, but served in the legislature of Virginia until 1786, when he became one of the executive council. The close of his life was embittered by pecuniary embarrassments and the entire wreck of his fortune. Consult Sanderson, ‘Biography of the Signers of the Declaration of Independence’ (5 vols., Philadelphia 1829).

BRAXY, BRACK, BRECK, BRASCES, BRAXET. Dysentery in sheep, inflammation of the coats of the intestines. Spinal apoplexy (in sheep); rapid and fatal; very prevalent in Scotland, England, Norway and France. It is often preceded by diarrhœa and attended by fever and constitutional disturbances. The word «braxy» is used to denote several different diseases in animals. The root meaning is generally given as from *break,* but this is very doubtful; it is more probably derived from the Scotch, middle and northern English, *brast, brasten, bresten* — to hasten, to be quick, which is cognate with the Norwegian name *brassot.* A sudden change of pasturage, more particularly from a succulent to a high and dry pasture, is one of the most frequent causes, and to this may be added exposure to wet and cold after traveling. It is a much more serious disease than simple diarrhœa and often becomes fatal in the course of a few days. The name is also applied to a blood disease resulting from plethora, which is considered by some to be the true braxy. In this case also a sudden change of pasturage is the most frequent cause of the disease, but the change which generally produces it is the reverse of that which produces the former, namely, a change from a low diet to rich and nourishing food. This disease is even more fatal than the former, and runs its course in a few hours. As there is no means of saving an animal which is once attacked, the only course is to avoid the causes which lead to the disease.

BRAY, Anna Eliza, English woman of letters: b. London, 25 Dec. 1790; d. there, 21 Jan. 1883. Her maiden name was Kempe; she studied for the stage, but in 1818 was married to Charles A. Stothard, son of the famous artist, and, after his death, became the wife of the Rev. Edward A. Bray, vicar of Tavistock. From 1826 to 1874 she wrote a series of novels, one of which, ‹The Talba, or the Moor of Portugal,› brought her the acquaintance of Southey. In 1884 they were collected in a 12-volume edition. She wrote the ‹Life of Thomas Stothard› (1856), and many books of travels. Her letters addressed to Southey, on the superstitions and scenery of Tavistock, entitled ‹The Borders of the Tamar and the Tavy› (1836; new ed., 1879), and ‹A Peep at the Pixies; or, Legends of the West› (1854), are much esteemed. Mrs. Bray's ‹Autobiography› appeared in 1884, edited by Kempe (London 1884).

BRAY, Frank Chapin, American editor and educator: b. Salineville, Ohio, 1866. Apprenticed early to a printer, he entered Wesleyan University, working his way through as printer and reporter, and graduated in 1890. The year following he became city editor of the *Herald* (Middletown, Conn.); 1892–94 was managing editor of the *Morning Despatch* of Erie, Pa.; for six years was on the staff of the *Literary Digest,* editing the ‹Topics of the Day› department; and from 1899 until its incorporation with the *Independent* in 1914 was editor of *The Chautauquan,* the organ of the Chautauqua Literary and Scientific Circle. In 1906 he was made editor manager of the Chautauqua *Press* which publishes the study courses of the Chautauqua circle. He is the author of ‹A Reading Journey through Chautauqua› (1905).

BRAY, Sir Reginald, English architect: d. 1503. He was the second son of Sir Richard Bray, one of Henry VI's privy councillors, and stood high in the favor of Henry VII at whose coronation he was created Knight of the Bath. Afterward he received the Order of the Garter and was made constable of Oakham Castle. He also received other important appointments and was one term in Parliament. At Blackheath he won distinction and was given a large estate and created a knight banneret. He is understood to have designed, if he did not actually execute, the beautiful chapels of Henry VII at Westminster. Another of his works, and now his final resting-place, is the almost equally beautiful chapel of Saint George's at Windsor.

BRAY, Thomas, English clergyman: b. Marton, Shropshire, 1656; d. London, 15 Feb. 1730. In 1678 he was graduated at Oxford and soon after appointed as vicar of Over-Whitacre and the rectory of Sheldon. Having entered the ministry of the Established Church he founded in 1698 the Society for Promoting Christian Knowledge and in 1700 organized the Anglican Church in Maryland. In the following year he secured a charter for the Society for the Propagation of the Gospel in Foreign Parts. He was rector of Saint Botolph's, Aldgate, London, from 1706. He devised a system of lending libraries for parish purposes and in 1723 established the still existing Society of Associates of Dr. Bray, which carries on his benevolent undertakings. He published a ‹Directorium Missionarium› (1726); ‹An Essay Toward Promoting All Necessary and Useful Knowledge› (1697), and several lesser works. In 1901 the Maryland Historical Society published a selection of his writings dealing with Maryland.

BRAY, a maritime town of Ireland, partly in county Dublin and partly in Wicklow, though mainly in the latter, picturesquely situated on both banks of the Bray, which here forms the boundaries of these two counties, 12 miles southeast of Dublin. The town, which has been popularly designated «the Irish Brighton,» has been much improved in recent years, new houses being built, and a broad esplanade formed. Pop. about 7,000.

BRAYERA, also known as Cusso or Kousso, a handsome ornamental tree of Abyssinia belonging to the rose family. Its scientific name is *Hagenia Abyssinica.* The leaflets number 6 to 12 to each leaf, and its stamens are in separate flowers from its pistils. The bunches of pistillate flowers, made into an infusion, are used in medicine for the expulsion of worms, especially the tape worm. The taste is bitter and unpleasant. The active principle is kosin, which is sometimes given by itself.

BRAYMAN, Mason, American soldier and lawyer: b. Buffalo, N. Y., 1813; d. 1895. He learned the printer's trade in early life, but took up the study of law and was admitted to the bar in 1836. Removing to Illinois he was employed by that State to settle the difficulties with the Mormons of Nauvoo, and secured their removal in 1844. He served in the Federal army during the Civil War, and at its close was brevetted major-general. He was territorial governor of Idaho 1876–81, and after the last named date practised his profession at Ripon, Wis., until his death.

BRAYTON ENGINE. See INTERNAL COMBUSTION ENGINE.

BRAZEN SEA, the copper basin or vase which King Solomon placed in the priest's court for the uses of the servitors. It was 5 cubits high and 30 in circumference, and was supported on 12 oxen facing outward. It seems probable that its original purpose was symbolical rather than practical. King Ahaz removed it to a stone pedestal and it was finally destroyed by the Chaldæans, who carried off the copper to Babylon.

BRAZEN SERPENT, a bronze or copper figure which Moses is said to have made and set up before the Israelites for the healing of all who had been bitten by venomous serpents. As this was subsequently superstitiously adored by the Israelites it was destroyed by King Hezekiah. Among the Phœnicians the serpent was regarded as the symbol of the god of healing.

BRAZIL (Estados Unidos do Brazil, land of red dye-wood, derived through the Portuguese *braza*, burning coal), is a federal republic bordering upon all of the South American countries except Chile, and bounded on the east, northeast and southeast by the Atlantic Ocean. It is nearly three times as extensive as any other Latin American country, and its natural resources are very great. Brazil requires, for the development of her resources, immigration and new industrial enterprises; for, in the vast equatorial and Amazonian regions, rank vegetation defies the efforts of casual settlers. In the following treatment the republic, with its political divisions, history, government, industries, etc., is treated under the following heads:

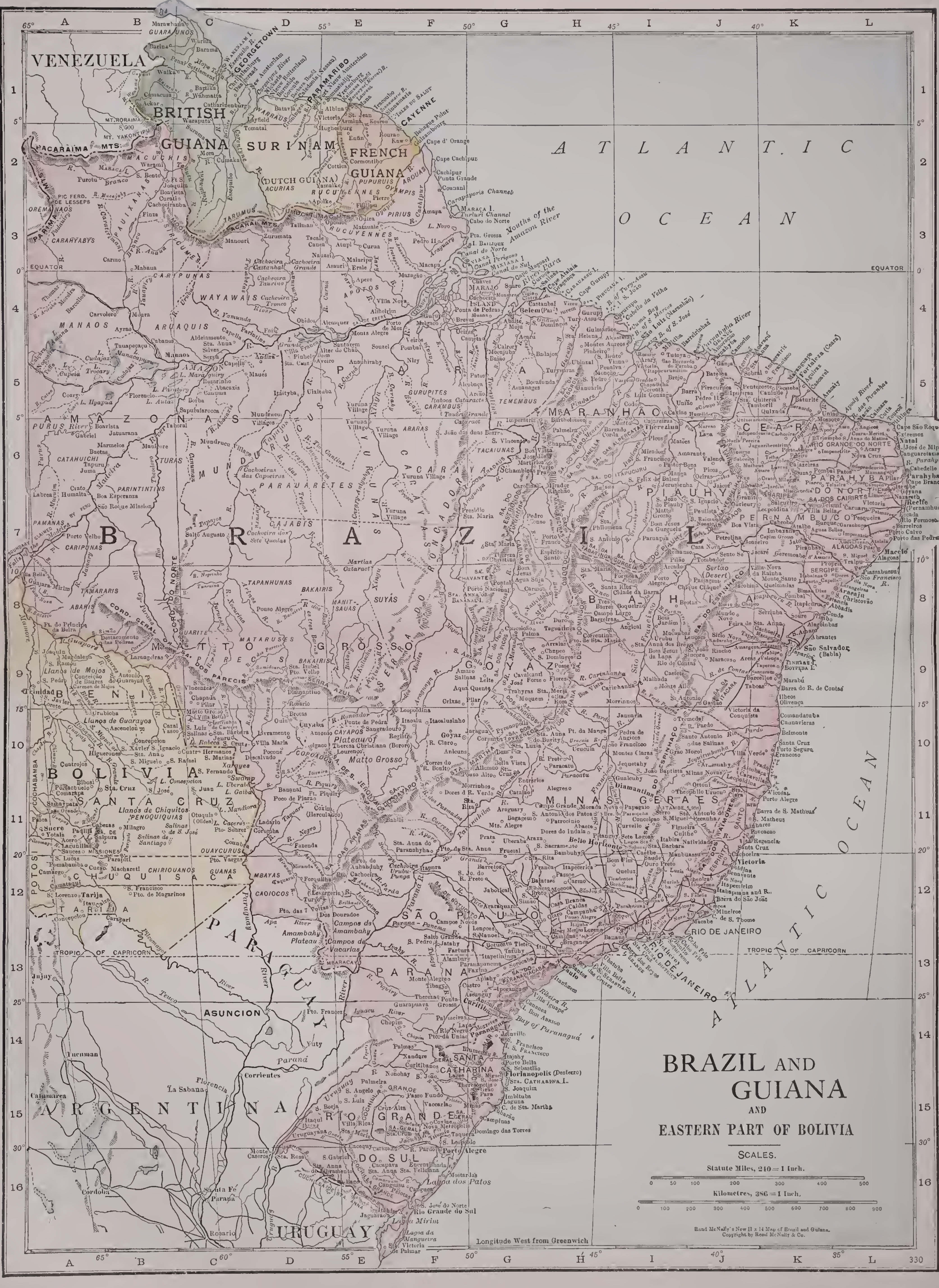
1. Typography and Climate
2. Political Divisions and Population
3. History
4. Government
5. Education and Religion
6. Agriculture and Forest Products
7. Commerce
8. Manufacturing and Mining
9. Banking and Finance
10. Transportation and Communication
11. The Army and the Navy

1. TOPOGRAPHY AND CLIMATE.

— The country extends between lat. 4° 22′ N. and 33° 45′ S. and long. 34° 40′ and 73° 15′ W. and the total area is 3,292,000 square miles. Nearly the entire population of the republic is still found on a comparatively narrow strip of land extending southward along the Atlantic coast from Pará, below the mouth of the Amazon, to the line of Uruguay, or on the banks of the Amazon and its chief northern and southern affluents. The white people have clung to the fringe of the continent which their ancestors took possession of in the 16th century; and (except on the southeastern plateau and along the main water-courses) no civilizing conquest and occupation of the interior, such as occurred in North America, have been effectively undertaken. The two largest Brazilian states have less than one inhabitant per square mile.

A vast table-land of irregular structure lies behind the seaboard of the south Atlantic, running from Cape S. Roque to the neighborhood of the Rio de la Plata, and covering the eastern half of the republic. Beyond this, toward the interior, across immense plains of sandy soil lies the central depression of South America. Toward the north, from a low, and very ancient, nearly effaced continental divide or watershed, extends the basin of the Amazon; and toward the south that of the Paraná. In the north the Amazon basin belongs to Brazil; in the south the Paraná and Paraguay rivers are Brazilian only in their upper reaches. South Brazil is limited to the belt of table-land. In the north the Amazon, both at its mouths and along the greater part of its basin, is a Brazilian river while to the south Brazil does not even reach the Rio de la Plata, the common estuary of the Uruguay, the Paraná and the Paraguay. The high plains of the interior have never been of economic importance, for the valley of the Amazon has been developed, of late years, to a very slight extent, and its population is as yet small. It is therefore the table-land of the Atlantic seaboard, from Ceará to Uruguay, that constitutes the soil of historic Brazil. Through its length of from 1,800 to 2,200 miles this table-land presents the greatest variety of aspect and has no hydrographic unity. Its height is greater in the south, where it reaches 3,200 feet; and this general slope from south to north is revealed by the course of the São Francisco. In Brazil the name Borburema is employed to denote the northern portion of the plateau. The dry season there is long and the Borburema gives a scant supply of water to the small seaboard rivers that flow, fan-wise, into the Atlantic over a plateau sloping gently to the ocean. In southern Brazil, on the contrary, the seaward face of the plateau is a huge bank 2,500 to 3,000 feet in height, separating a narrow strip of coast from the inland regions. This long bank or watershed, the Serra do Mar and Serra Geral, is a barrier which, for a great distance below São Paulo, no river pierces. The streams which rise upon its landward side, almost within sight of the Atlantic Ocean, cross the whole width of the plateau before they join the Paraná or the Uruguay. The Serra do Mar is not properly a mountain range, although from the ocean it has the appearance of one. Beyond the *serra* is Minas, a confused mass of mountain groups. The Mantequeira, a colossal backbone of granite, crosses southern Minas. Across the São Paulo frontier there is no more granite, and the landscape grows tamer. Primitive measures of gneiss and granite, out of which the Serra do Mar is carved, are hidden under a bed of sedimentary rocks. The topography of the country changes with the geologic structure. The outcrops of sandstone crossed in traveling westward cut the table-land into successive flats. Irregular ranges turn their abrupter slopes toward the east; and these cliffs of sandstone are locally known as the *serrinhas.* In Santa Catharina and Rio Grande do Sul great eruptions of basaltic rocks cover a portion of the plateau; the basalt has even reached the seaboard, and south of the island on which Desterro, or Florianopolis, is built, it overlies the granite of the Serra do Mar. The southern flank of the plateau overlooking the prairies of Rio Grande, where the Pampas of Argentina and Uruguay commence, is also basaltic.

The various regions of Brazil owe their peculiar character above all to the vegetation. The forests are concentrated in two regions — the Amazon Valley and a long strip of seaboard on the Atlantic coast, from Espirito Santo southward, where the Serra do Mar, "receiving the humidity of the ocean winds upon its dripping flanks, produces far to the south the conditions which have made the



BRAZIL AND GUIANA
AND
EASTERN PART OF BOLIVIA

SCALES.

Statute Miles, 240 = 1 Inch.

0 50 100 200 300 400 500

Kilometres, 386 = 1 Inch.

0 100 200 300 400 500 600 700 800 900

Rand McNally's New 11 x 14 Map of Brazil and Guiana.
Copyright by Rand McNally & Co.

Amazonian basin the home of the equatorial forest." The same impenetrable growth lines the slopes of the *serra* for a distance of 1,200 miles and encircles Rio. Far inland, or at a distance west of the coast ridge, the basins of the Rio Doce and the Parahyba, as well as the southern and western parts of Minas Geraes, are afforested. Also in the states of São Paulo and Paraná forests are found beyond the *serra;* and on the plateau they alternate with prairies. Beyond the agricultural regions, toward the interior, is the *Sertão,* a great land without house or trail.

In his 'New Discovery' ('Nuevo Descubrimiento') Acuña wrote that the climate on the Amazon itself and in all the adjacent country is temperate: to such an extent that there is no heat to prove disagreeable, no fatiguing cold (*ni frio que fatigue*), nor variations in temperature. This does not apply to districts in which the mitigating effects of the trade winds are less apparent. The whole interior of Brazil has only steady heat, with a very slight range in temperature throughout the year somewhat modified by well-defined dry and rainy seasons. The rainy season begins in September or October, bringing with it the time of plenty, and for the herds of cattle an abundant pasturage. March brings back the drought. The vast regions of the dry and rainy seasons extend toward the south beyond the Tropic of Capricorn; still farther south the variations of temperature become more marked. In southern Brazil frosts occur from June to September. On the ocean side of the *serra* there is no alternation of seasons; all the months of the year are alike; and there are no strictly cool, cold or dry periods.

Observing the action of the trade winds on the temperature of the Amazon Valley, a larger and more characteristic equatorial region, Mozans writes: "Although our course was almost directly under the equator the thermometer rarely rose above 75° F. One entry in my diary, made near Tabatinga, reads as follows: 'Temperature at 7 A.M. 68° F.; at 10 A.M. 67° F.— cool enough for a light overcoat.' Another entry, made near Obidos, reads: 'Very cool all day. Temperature from 68° F. in the morning to 66° F. in the afternoon.' Still another observation at 6 o'clock in the evening, on board our steamer in mid-river, gives the remarkably low temperature of 62° F. at Pará, which is sometimes supposed to be a place where one gasps in a fierce, unintermitting, intolerable heat. The maximum heat encountered at the chief towns between Iquitos and Pará is never so high as it often is in New York and Chicago, notwithstanding the difference in latitude of nearly 3,000 miles." Entries in the diary of the author of this article give, for various points in equatorial Brazil, a somewhat higher range of temperatures, with a maximum of 86° F. at noon on a single occasion.

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MARRION WILCOX.

2. POLITICAL DIVISIONS AND POPULATION.— The Federation of Brazil consists of 20 states, the Federal district and the territory of the Acré. In alphabetical order, with their areas and populations, capitals and populations in 1912 they are as follows:

State	Area (in square miles)	Population
Alagôas	22,583	848,526
Amazonas	732,439	378,476
Bahía	164,643	2,746,443
Ceará	40,247	1,179,197
Espirito Santo	17,312	362,402
Goyaz	288,536	428,661
Maranhão	177,561	683,645
Matto Grosso	532,683	191,145
Minas Geraes	221,951	4,628,553
Pará	443,903	809,886
Parahyba	28,854	630,171
Paraná	85,451	554,934
Pernambuco	49,573	1,649,023
Piauhý	116,523	441,350
Rio de Janeiro	26,634	1,325,927
Rio Grande do Norte	22,195	424,308
Rio Grande do Sul	91,333	1,682,736
Santa Catharina	28,632	463,997
São Paulo	112,307	3,700,350
Sergipe	15,093	426,234
Federal District	538	975,818
Acré Territory	73,000	86,638

The number of inhabitants in the entire country is approximately 27,000,000, the increment being, therefore, 14,000,000 in 27 years, the population in 1890 having been 14,333,915. The estimated population in 1915 was 26,600,000. The rate of growth in São Paulo is noteworthy. That state had 837,000 inhabitants in 1872; in 1890 it had 1,384,000; in 1900 it had 2,280,000; and during the next 16 years the increase was over 2,000,000. The state capital, also called São Paulo, with only 35,000 inhabitants in 1883, grew with the growth of the coffee-trade and the general prosperity of the state so rapidly that in 1907 the number of its inhabitants was 340,000, and in 1916 about 400,000. The growth of population in Acré territory's seringa forests is also rapid. But such increment as is noted seems slight in view of the fact, emphasized in Bryce's 'South America,' that "taking Brazil as a whole, no great country in the world owned by a European race possesses so large a proportion of land available for the support of human life and productive industry." The same observer is authority for the statement that one can hardly reckon the true Brazilian white nation at more than 7,000,000, the other elements being negro, colored, aborigines of the Amazonian forests, half-breeds, etc.; and, finally, the foreign element, more important by reason of its energy and industry than on account of numbers, since it probably little exceeds 1,000,000. Substantial increase may be anticipated at Porto Alegre, Pelotas, and the city of Rio Grande do Sul, the three gateways on the Atlantic coast giving access to the rich agricultural plateau of the southernmost Brazilian state.

For abstracts of census reports of population, consult the 'Brazilian Year Book' and publications of the Pan American Union; for descriptions of the inhabitants of large cities and towns, and for studies of native races, the accounts of travel or exploration mentioned in bibliography under HISTORY.

The number of immigrants entering Brazil from 1908 to 1916 was 926,282. These include 354,820 Portuguese, 190,767 Spaniards, 153,950 Italians, 49,477 Russians, 41,534 Turco-Arabs, 33,578 Germans, 21,843 Austrians, 15,773 Japanese and 9,207 French.

Brazil has for years past welcomed foreign immigrants and has made considerable effort to turn the tide of European emigration to her own shores. From 1820 to 1915 the number of immigrants officially entering Brazil is given as 3,363,456, or an average of 35,400 per year. But this official statement covers only a part of the immigration, that part entering the country through the ports of entry; but it takes no account of the population that is and has always been coming across the borders of the country from neighboring Latin-American nations during the past century. In all cases of population it is probable that the government estimate is rather under than over the mark owing to the fact that vast stretches of the inland territory of the republic are never visited by the census taker. The Old World immigrants entering Brazil in 1915 were as follows: Portuguese, 15,118; Spaniards, 6,895; Italians, 5,778; Russians (principally Poles), 640; Syrians, 514; French, 410; English, 311; Austro-Hungarians, 104. The total officially reported immigration during the year was 30,287. But here again the Latin-American immigrants are not recorded. Help in the way of subventions was extended to 17,709 of the officially reported immigrants by the Brazilian government, which has for some years past expended considerable money and effort to attract the better class of immigrants. Since 1825 Germans have been going to Brazil where they have helped to develop the coffee and rubber interests, among various other activities. In the southern states of Rio Grande do Sul, Santa Catharina and São Paulo, they have formed important colonies which have been fostered by the Brazilian and German governments and the German steamship company. To these and to other immigrants the Brazilian authorities in the latter part of the 19th century extended free passage from their homes in Europe to their destination in Brazil together with cheap land ($1 to $2 per acre) and seeds, provisions and implements for the first crop. They had from 7 to 10 years in which to pay for the land. But Germans, Poles, Italians, Portuguese and Spaniards flooded into the country, and the government soon began to restrict the privileges and inducements offered to immigrants. Finally it gave a different complexion to the immigration question by the passage of an immigration law encouraging the formation of strong colonization companies to whom vast stretches of land were offered at very cheap prices on the condition that they should be settled with immigrants at the expense of the operating company which was to receive a subvention of $320 for each family brought into the country and settled on these lands. To encourage the opening of ways of communication a subvention of $700 per mile was offered for roads built. Political troubles two years later interfered with immigration and discouraged the numerous colonization companies which had taken advantage of the new law. Since then immigration into Brazil has been slow compared wth the vast extent of the country, though some years, as 1911, for instance, recorded many newcomers (136,000). Lately the Brazilian government has begun to extend help to immigrants once more.

J. H. CORNYN.

3. HISTORY.— Brazil was discovered in 1500 by a companion of Columbus, Vicente Pinzón, who made no settlement, and, indeed, would not have been justified in doing so. The bull of Pope Alexander VI (4 May 1493) had bestowed upon Portugal the lands which should be found east of the line of demarcation, and commissioners of Spain and Portugal had agreed, on 7 June 1494, that the position of the line of demarcation should be changed so that it should pass, north and south, 370 leagues west of the Cape Verde Islands, instead of at a distance of only 100 leagues west of those islands, where the Pope had established it. Accordingly Spain was precluded by her own act from claiming the eastern portion of the continent of South America. A Portuguese commander, Pedro Alvarez Cabral, when on his way around the Cape of Good Hope to the Far East, in 1500, encountered severe storms which drove his vessels from their course; and through this mischance he reached the Brazilian coast in April. Mass was celebrated there on Easter Day; the country was declared a dependency of Portugal, and a stone cross was erected. There Cabral himself embarked for India, but first sent a vessel to Lisbon with a report of this important discovery. As soon as practicable after receiving the account of his new possession, Dom Manoel placed three vessels under the command of Amerigo Vespucci, instructing this Florentine to make good Portugal's claim to the land which a Spaniard had discovered. Thus, from the beginning, Brazil was marked out as a field for international competition. Vespucci's first voyage being unsuccessful, a second was undertaken with better results. He remained for five months at a point he named «All Saints,» and when it became necessary to return left 12 men as a garrison in a small fort. The impression created by the experiences of the early adventurers was not highly favorable. Poor and unattractive, indeed, did this land seem in comparison with India and Africa. During the years that followed Portuguese merchants dispatched vessels to trade for Brazil-wood, and the Portuguese government jealously resisted French and Spanish attempts to gain a foothold or carry on commerce eastward of the line of demarcation; but the court at Lisbon continued to prefer the profits to be won along the course that Vasco da Gama had opened up. The first settlements, therefore, were not made by the government, but by grantees whom the government induced to colonize by assigning to each leader a splendid possession, or «captaincy»— no less than 50 leagues of coast, with feudal powers and the privilege of extending his domain as far inland as he desired. Thus the province of São Paulo was settled by an expedition under Piratininga; next Affonso de

Sousa explored the coast from Rio de Janeiro (so called because it was discovered 1 Jan. 1531) to the Rio de la Plata. Lopez de Sousa received two allotments of 25 leagues each, one being near Pernambuco and Parahyba. Fernandez Coutinho and Pedro da Campo Tourinho established themselves near the spot where Cabral landed. Francisco Pereiro Coutinho received a grant of a captaincy, extending from Rio São Francisco to Bahía. The captaincy of Pernambuco was given to Duarte Coelho Pereira; and so the most attractive portions of the coast were distributed. Cattle and sugarcane being introduced from Madeira, the systematic cultivation of the latter began. Enormous difficulties were encountered from the first by proprietors and planters. Only men of large means, among them adventurers who had amassed fortunes in India, were able to equip and maintain such a considerable force as was necessary to make these undertakings successful. The natives were, as a rule, extremely mistrustful, savage and little inclined toward civilization. In fact the task of civilizing them seemed utterly hopeless. Yet one striking exception to the general experience may be noted. The first settler in Bahía was Diogo Alvarez, a young man of noble family, who was wrecked on the shoals near that port. «Part of the crew,» says Southey, «were lost, others were eaten by the natives.» Diogo secured the favor of the Indians by recovering things from the wreck. Afterward he led them in battle, using his musket to such good effect that he became their sovereign, and took daughters of the chiefs of the savages to be his wives. «The best families in Bahía,» we are told, «trace their origin to him.»

By the middle of the 16th century the captaincies of those men whose names have been mentioned, and those of other adventurers, were scattered along the coast from the mouth of the Amazon to that of the Rio de la Plata. The great mineral wealth of the country had not been discovered at that time, and the settlements were chiefly devoted to the cultivation of sugar. What with savages surrounding these widely separated posts; Spaniards threatening them from the rear (the Spanish troops then holding the regions afterward to be known as Paraguay and Argentina); and the French from time to time attempting to establish themselves on the coast; it was found necessary to provide for the common defense by concentrating the Portuguese power in the hands of a governor-general. The feudatories had to submit to the revocation of some of their privileges, though they remained on the soil which they owned.

The first governor-general was Trome da Sousa, and his capital was Bahía. In 1549 he was reinforced by a fleet of six vessels with 320 soldiers and officials, 400 convicts, 300 free colonists and 6 Jesuits. At different times wards of the Crown, female orphans of good family, were sent out, provided with portions from the royal estates, and given to the provincial officers in marriage. The establishment of the College of São Paulo in Piratininga followed hard upon the arrival of the first bishop of Brazil in 1552, and of a number of Jesuits in 1553. Avowed friends and protectors of the natives, these members of the Society of Jesus took upon themselves the pioneer's task, and their college became a centre of influence. Intrusive French settlers at Rio de Janeiro were driven out by the governor, and a Portuguese colony was founded there in 1567. But the progress of Brazil, in so far as it was dependent upon the aid of the mother country, was checked, if not entirely arrested, during a period of 60 years. Philip II of Spain acquired the crown of Portugal in 1578–80, and the union of the two countries — or rather, the subordination of the weaker nation — continued until 1640. Brazil received little attention during all these years, in part because she was identified with Portugal, but still more for the reason that her inferiority to the Spanish possessions in mineral wealth was taken for granted. The transfer of allegiance invited attack by English fleets. In 1586 Witherington sacked Bahía; Cavendish, in 1591, burned San Vicente; Lancaster, in 1595, captured Olinda. A futile attempt to found a permanent colony was made by the French (1612–18), and the Dutch dispatched a fleet against Bahía in 1624.

The Dutch in Brazil.— Most important were the efforts made at this time by an association of Dutch merchants, the famous Dutch West India Co., which commissioned Count Maurice of Nassau to promote the interests of his countrymen in South America. The enormous power of this corporate company, which, as Bancroft says, was «given leave to appropriate continents,» and, when «invested with a boundless liberty of choice, culled the rich territories of Guiana, Brazil, and New Netherland,» was exerted in a large part of the region lying between Maranhão and Bahía. After the revolution of 1640, Brazil was, indeed, no longer Spanish, but the new Portuguese executive of the house of Bragança was too poor and weak to adopt such vigorous measures as were required. Accordingly a suggestion offered by a native of Madeira named Vieyra was welcomed, inasmuch as this plan relieved the government of the obligation to fight the Dutch West India Co. Vieyra proposed the establishment of a commercial company at Lisbon similar to that which had its headquarters at Amsterdam. The Brazil Co. of Portugal was organized, and in 1649 sent out its first fleet. After five years of severe fighting, the Portuguese merchants overcame the Dutch merchants.

For half a century Brazil was permitted to remain at peace. In 1710, however, a French squadron under Duclerc attacked Rio de Janeiro and suffered defeat. On 12 September of the following year Admiral Duguay Trouin arrived off Rio with a new fleet and 6,000 men. The governor was compelled to capitulate and to pay a large sum of money. A great change in the industrial conditions of the southern districts was produced by the discovery of diamonds at this time (1710–30), and by the rush to the gold regions opened up by the enterprise of the colonists of São Paulo, a hardy race, with a large admixture of Indian blood, much addicted to adventurous raids into the interior. Their explorations extended westward into Paraguay and northward into Minas, Goyaz and Cuyabá in the state of Matto Grosso. Gold was discovered in the regions last mentioned; by the beginning of the 18th century there were five towns of considerable importance in Minas Geraes; and that state is now one of the most populous of all. Laborers were withdrawn from the sugar industry by the superior attractions of mining, and Brazil lost her leading position as a sugar-producing country. The conspiracy of Minas in 1789 was the first sympathetic movement in Brazil occasioned by the Revolutionary War in North America. Inspired by the success of the English colonies in achieving independence, the inhabitants of Minas formed a project to throw off the Portuguese yoke, but the plot failed, the leader was hanged and the conspirators were banished to Africa, from which continent slaves were being imported in large numbers. It was an unprofitable exchange for America. The French Revolution, among its extraordinary consequences, promoted Brazil from the humble position of a colony to be the seat of government of the Portuguese power, and the only American monarchy. In 1807 the threat of the invasion of Portugal by Napoleon sent the prince regent, afterward King John or Dom João VI, across the ocean (29 November). With him went the Queen, the royal family, the great officers of state and members of the nobility. He created many new offices, and otherwise made the machinery of government in Brazil much more elaborate than it had ever been; and, to meet the increased expenses that these changes involved, at first imposed new taxes, and afterward, by debasing the money standard, inaugurated the long period of financial error that impeded the advancement of the country. On the other hand, Brazilian ports were declared open to the commerce of all nations at peace with Portugal. Thus John favored industrial development and injured it at the same time. Numbers of artisans and manufacturers from England, Germany, France and Sweden came to take advantage of the new opportunity. In 1816 the School of Fine Arts was founded by French painters and sculptors. The occupation of Portugal by French troops was offset in the new world by the incorporation of French Guiana with Brazil (1809); but the treaty of Vienna in 1815 restored Guiana to France. On 16 Jan. 1815, the title of kingdom was conferred upon Brazil; and an important extension of the domain of this unique American monarchy was effected six years afterward, when Uruguay was united with it under the title of the Cisplatine State. But this union, like the occupation of French Guiana, was destined to be temporary, owing to the policy adopted by Argentina. See ARGENTINA.

Independence Proclaimed.— The general movement in favor of independence that transformed the Spanish colonies north, south and west of Brazil into republics produced conspiracies and plots in Bahía and Pernambuco. Troops were brought out from Portugal to restrain every violent manifestation of the republican spirit. Meanwhile, however, in Portugal itself the revolution of 1820 had led to a modification of the old autocratic system, and the forces from that country, openly sympathizing with the aspirations of the Brazilian people, compelled King John to yield. The latter withdrew from America soon afterward (26 April 1821), leaving his son, Dom Pedro, to work out the problem in Brazil as best he might. The attitude of the Cortes of Portugal in this crisis was exceedingly unwise: instead of offering concessions, it directed the dissolution of the central government, and ordered Dom Pedro to return to Portugal. Assured of the support of the people of Rio de Janeiro and São Paulo, who requested him to disobey this command, Dom Pedro proclaimed the independence of Brazil, 7 Sept. 1822. He became constitutional Emperor the following month. In the hostilities which ensued the Brazilians were so successful that independence was assured before the end of 1823. The constitution of the empire was adopted on 25 March 1824. But a peculiar situation in the ruling family remained to be disposed of. Since October 1822, Dom Pedro had been Emperor of Brazil, while his father was King of Portugal. The dramatic climax occurred 25 Aug. 1825, when a treaty was signed in London by virtue of which King John first assumed the title of Emperor of Brazil and then immediately abdicated in favor of his son. As the popularity of Dom Pedro I was due to the disposition he showed at first to accede to the wishes of the liberals, so it is necessary to ascribe his loss of popularity in the years 1826–31 to his unwillingness to trust the people more and more, as their demand for participation in the government steadily increased. The statement found in some recent histories, to the effect that Pedro I was a brutal tyrant, whose reign ended in public disgrace, is incorrect. It was his tact that saved the monarchy in 1821; but the growth of republicanism in the next decade was much more rapid among the people than at his court, and finally the breach became so wide that no course was left to him but to surrender his crown before the succession of his son, the 2d Pedro, should be disputed, and to take ship for Lisbon, where it had become a duty to defend the claim of his daughter, Maria II, to the throne of Portugal. At any time after 1810 outrageous tyranny on the part of Portuguese rulers would have thrown Brazil into the advancing column of revolutionary states. The significant facts are, that Pedro I was able to postpone the inevitable change for 10 years, and that Pedro II (whose majority was proclaimed 23 July 1840) succeeded in maintaining the monarchical form in America until 15 Nov. 1889. The regency by which the affairs of Brazil were administered (1831–40) was much like a republican government, especially after 1834. Probably it would have been impossible to revert to a monarchy if the weakness and misconduct of the regents had not brought discredit upon everything savoring of democracy.

The suppression of the revolution of 1848; discontinuance of the importation of slaves, in 1853; and the creditable part taken by Brazil in thwarting the ambitious designs of the Argentine dictator, Rosas (see ARGENTINA)— these are the chief events before 1855. In that year a Brazilian squadron was sent to settle a dispute with Paraguay as to the right of way for Brazilian vessels on the Paraná River. This river which rises in Brazil, flows beside Paraguay, and finally through the territory of Argentina, it was declared should be open to the commerce of all three nations equally. The warships failed to accomplish the desired result, and for a decade vexatious restrictions were placed upon the vessels of Brazil, Argentina and the United States. In 1865 an outrage by Lopez, the dictator of Paraguay, brought on a war in which Brazil, Argentina and Uruguay were allied against the offending country (see PARAGUAY). This bitter struggle, protracted until 1870, cost Brazil the lives of many thousands of her citizens, and about $300,000,000. In the year following the restoration of peace a law was enacted for the abolition of slavery, the growth of which had been checked in 1853. It was provided that thenceforth every child born of slave parents should be free.

Brazil a Republic.—A bloodless revolution terminated the reign of Dom Pedro II, and the Federal republic was proclaimed, 15 Nov. 1889. A provisional government, instituted for this purpose, published (24 Feb. 1891) the constitution of "The United States of Brazil," resembling that of the United States of America in nearly every respect, though Brazilian senators serve for nine years, like those of Argentina, while the President's term of office is but four years. Marshal Deodora da Fonseca, head of the provisional government, was confirmed in the presidency by the Constitutional Congress, and Gen. Floriano Peixotto was elected Vice-President. The next President (15 Nov. 1894) was Prudente de Moraes Barros. The 3d President, Dr. Manoel Ferraz de Campos Salles, was elected for the term beginning 15 Nov. 1898. His successor, Señor Francisco de Paula Rodrigues Alves, inaugurated 15 Nov. 1902, made a statement of the national policy in his inaugural address which may be summarized as follows: A good financial condition in the republic is of prime importance; but scarcely less essential are reforms in the laws applicable to civil suits and elections. Agricultural and commercial conditions must be improved, and endeavors made to attract immigration and capital. Modern systems of sanitation must be installed at the ports, including Rio de Janeiro. The augmentation of the army and navy may be undertaken when the condition of the treasury warrants such expenditures.

It will be readily understood that the circumstances to which reference has been made in this sketch, such as the issuance of large amounts of paper currency, which it was formerly the fashion to call irredeemable; the change from the basis of slave to free labor; the overthrow of the monarchy; foreign wars, and rebellions in one state after another, have combined to depress Brazilian credit and retard industrial development. To these unfavorable influences must be added the decline in the prices of coffee, Brazil's staple product, and of sugar, her chief reliance in times past. On the other hand there is observable a tendency toward greater stability in the national policy; a large amount of paper money was, before 1903, called in and destroyed; and interest has been shown recently in efforts to develop the enormous natural resources of the country and to maintain standards of health in the chief ports. In November 1903 the dispute with Bolivia in regard to the Acré region was terminated, Bolivia surrendering her claims to 73,750 square miles on or near the Acré River in return for 886 square miles on the affluents of the Madeira and Abuna, 335 square miles on the left bank of the Paraguay, and the sum of $10,000,000 which Bolivia has expended with excellent results for the construction of railways.

Brazil, by virtue of the same agreement (Treaty of Petropolis, Article 7), was placed under an obligation which has been scrupulously discharged, namely, "to build on Brazilian territory, by herself or by a private company, a railway" which, in brief, supplies an outlet to the Madeira and Amazon for Bolivian products. In June 1914 the dispute with Great Britain over the frontier of British Guiana was ended by the award of the arbitrator, the King of Italy, who gave 14,000 square miles to Brazil and about 19,000 square miles to the other contestant. In 1906 Dr. Alfonso Penna was elected President. An international conference was held at Rio de Janeiro 23 July to 27 Aug. 1907. The occasion was made memorable by the formal visit of Elihu Root, Secretary of State of the United States. President Penna decreed, 13 Jan. 1908, a reduction of the tariff duties on several American products, in return for the favor shown by the United States to Brazilian coffee. An arrangement was made with the Imperial Emigration Company of Tokio for bringing over 3,000 Japanese colonists within two years at the expense of Brazil (see article LABOR). President Penna died 14 June 1909 and was succeeded by Vice-President Peçanha. Marshal Hermes da Fonseca was elected to the presidency 1 March 1910. On 22 November the crews of the warships *Minas Geraes* and *São Paulo* mutinied in the harbor of Rio. These vessels were surrendered to the government 27 November. Baron Rio Branco died in 1912, and was succeeded as Foreign Minister by Gen. Lauro Müller. In 1913 relations between the United States and Brazil were strained in consequence of the action filed by the administration of the former country against the Brazilian committee in charge of the valorization of coffee. After the dismissal of the valorization suit, Brazil restored the preferential tariff on American products, which had been suspended during the dispute, and Gen. Lauro Müller returned Secretary Root's visit. In 1914 Vice-President Wenceslão Braz was elected President. In May 1915 a treaty of alliance was signed at Buenos Aires by representatives of Brazil, Argentina and Chile. Three months later Brazil was associated with the United States, Chile, Argentina, Uruguay, Bolivia and Guatemala in efforts to restore law and order in Mexico. In 1916 Brazil continued to feel, more than other Latin American countries, the extremely injurious effect of the scarcity of ships, withdrawal of credits, soaring prices and declining rate of exchange which the European War occasioned. This subject is examined in its proper connection and relations in the articles COMMERCE and BANKING AND FINANCE.

War with Germany.— When Germany announced her program of unrestricted submarine warfare in February 1917 the Brazilian government protested, stating at the same time (13 February) that the German government would be held responsible to Brazil for all the consequences thereof and threatening to break diplomatic relations in the event of a submarine attack against a Brazilian vessel. On 4 April the *Paraná,* a Brazilian vessel, was torpedoed without warning, and six days later the Brazilian government severed diplomatic relations with Germany in accordance with the terms of its note of 13 February. On 28 April 1917 Brazil issued a proclamation of neutrality with regard to the war between the United States and Germany. The Brazilian Congress met on 3 May 1917 and on the 22d of the same month the President in a message recommended the revocation of the proclamation of neutrality, wishing to emphasize the solidarity of Brazil with the United States. Other sinkings of Brazilian vessels aggravated the situation between Germany and Brazil. On 29 May the President was authorized by Congress to withdraw the decree of neutrality and to utilize the German ships which had been taken in charge about a month before. On 29 June the decree of neutrality of 4 Aug. 1914 with regard to the war between Great Britain and Germany was withdrawn. American and Entente warships were now free to enter Brazilian ports and an American fleet visited Rio, where it received a great ovation. Brazil's navy co-operated with that of the United States in patrolling the south Atlantic. On 25 October President Braz sent a message to Congress stating that Germany had virtually brought a state of warfare on Brazil and recommended that Congress authorize a formal declaration of a state of war. On the 26th, therefore, by a vote of 149 to 1 and a unanimous vote in the Senate, such a declaration was authorized and a state of war was proclaimed on 27 October. See Latin America and the War.

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4. GOVERNMENT OF BRAZIL. The system of government established after the bloodless revolution of 1889, and under the constitution of 1891, has already been mentioned and in part characterized (see History). The official title of the nation, The United States of Brazil (Estados-Unidos do Brazil), conveys at a glance the correct impression that we are dealing with a Federal rather than a centralized republic; but its constitution resembles that of the United States of America, and the rights of the states of Brazil are emphasized, probably somewhat over-emphasized; so a situation has been created similar to that which would be found in the United States of America if the question of broad or strict construction of the constitution, that dividing line between political parties, had been determined chiefly in favor of the states' rights.

The President and Vice-President are elected by direct vote for a term of four years, and may not be re-elected for the term immediately following. The President's salary is 120,000 milreis (or about $38,000). He is assisted by a cabinet of eight ministers whom he appoints. The ministries correspond to the departments of Justice, Interior and Public Instruction, Foreign Relations, the Navy, War, Communications and Public Works, Finance and Agriculture, Industry and Commerce. The legislative power is vested in the National Congress, which embraces the Senate (63 members, three for each state and three for the Federal district, elected by district vote for nine-year terms: membership renewed by thirds every three years) and the Chamber of Deputies (elected in the same manner as the senators, but for terms of only three years, and in the proportion of one for every 70,000 inhabitants, no state, however, being represented by less than four deputies). Congress meets annually on 3 May for four months, but may be prorogued or called in extra session by the President. The franchise extends to all male citizens over 21 years of age, duly enrolled, except beggars, illiterates, soldiers actually serving and members of monastic orders under vows of obedience. The President must be a native of Brazil over 35 years of age. In legislation relating to taxes, the initiative belongs to the Chamber of Deputies. There is a Supreme Federal Court of Justice at Rio de Janeiro, and a Federal judge in each state. The former consists of 15 justices appointed by the President with the advice and consent of the Senate; the Federal judges are appointed upon the Supreme Court's recommendation, justices and judges alike holding office for life. There are also, for purely local or unimportant matters, municipal magistrates and justices of the peace who are elected for four years.

State governments resemble the Federal in having separate administrative, legislative and judicial branches; and the design has been to prevent loss of independence by any one of these, or the subordination of all to the national executive. The latter, accordingly, has not the extensive powers of appointment and control which are exercised by presidents of some of the more centralized South American republics. Governors of states and members of state legislatures hold elective offices, and to the former is assigned the appointment of magistrates who are not removable from office save by judicial sentence. Each state is governed in accordance with its own constitution and laws. These must, of course, never conflict with the constitutional principles of the Union; and it is provided that, in case of such infringement by state authorities, the Federal government shall, by force of arms if necessary, intervene to control the offending state. But not otherwise is intervention conceded as a Federal right. The Federal district is administered by a council elected by qualified voters, and the municipal executive authority there is exercised by a prefect appointed for four years by the President of the republic.

The tendencies referred to receive considerate treatment at the hands of M. Denis ('Le-Brésil,' etc.). "The States — the one-time provinces," he writes, "enjoy a very large degree of independence. Each of them forms an actual nation, with its elective authorities and its autonomous administration." He finds that individual states "freely negotiate contracts with foreign companies or syndicates for the execution of public works or raising loans. They have their systems of justice and of public education. Some of them have representatives in Europe who play the part almost of diplomatists; who have been known to hold conferences and to sign conventions without the intervention of any Federal authority. The Constitution has afforded them an important source of revenue in allowing them to establish export duties. I believe there is no State budget which does not place export duties in the first rank among its receipts. The export duty on coffee swells the budget of São Paulo, as the export duty on maté swells that of Paraná. Thus Brazil has a double line of custom-houses, one facing outward, one inward. The duties collected upon foreign merchandise entering the country being a Federal matter, depends upon the central government; but the export duties are State property. In equilibrium with the States the Constitution erects the Federal government." Now, the Union (if we adopt the shorter name, preferred by the people themselves), by the regulation of monetary questions and by the settlement of the customs tariff, exercises a deeply felt influence over the national life; and although at first very narrowly confined to specified functions, a tendency has become manifest to exalt its authority and dignity. "In the first place the Union acquired its own territory — the Territory of Acré, which was ceded by Bolivia (q.v.) by the treaty of Petropolis. This territory is a considerable portion of the Amazonian plain, and one of the chief rubber-producing countries. Instead of making a new state of Acré, it has been kept by the Union as a kind of dower. The Union collects the export duties on rubber, which duties, except in this Federal Territory, go to the treasuries of the States. The revenues of Acré were insufficient in the three years to pay off the indemnity to Bolivia. To-day they are added to the other sources of Federal revenue, and form a notable addition to the Union's budget." An indication that the Union has begun to "find itself" is this: it decided to intervene, or to impose its will upon the more shiftless states, in respect to education and the colonization of immigrants. Viscount James Bryce writes that "the immense size of the country and its want of homogeneity suggested a Federal system, the basis for which already existed in the legislative assemblies of the provinces. Since then Brazil has had its full share of armed risings and civil wars. At first the States were allowed the full exercise of the large functions which the constitution allotted to them, including the raising of revenue by duties on exports and the maintenance of a police force which in some States was indistinguishable from an army. Presently attempts were made to draw the reins tighter, and these attempts have continued till now." His observations and impressions in this field are to the effect that the national government "has latterly endeavored to exert over the States a greater control than some of them seem willing to accept. Nor is this the only difficulty. While some of the States, and especially the southern, have an intelligent and energetic population, others remain far behind, their citizens too ignorant and lazy, or too unstable and emotional, to be fit for self-government. Universal suffrage in districts where the majority of the voters are illiterate persons of color suggests, if it does not justify, extra-legal methods of handling elections. One illegality breeds another, and there is perpetuated a distrust of authority and a resort to violence." In many regions it is quite true that the Brazilian constitution, as M. Georges Clémenceau writes in his 'South America of To-day,' "enjoys a chiefly theoretic authority." Viscount James Bryce continues: "In the Brazilian politics of to-day there are many factions, but no organized parties nor any definite principles or policies advocated by any group or groups of men. Federal issues are crossed and warped by State issues, State issues confused by Federal issues, and both sets of issues turn rather on persons than on general doctrines or specific practical proposals. One source of dissension is, however, absent — that struggle of the Church and clericalism against the principles of religious equality which has distracted the Spanish-American republics. In Brazil the separation of Church and State is complete, and though the diplomatic corps enjoys the presence of a papal Nuncio as one of its members, this adherence to tradition has no present political significance. The absence or the fluidity of parties makes the executive stronger than the legislature both in National and State politics. There are many men of talent, especially oratorical talent, and many men of force, but not enough who show constructive power and the grasp of mind needed to handle the enormous economic problems which a country so vast, so rich and so various presents.» He concludes, however, that it is too soon to be despondent, inasmuch as the country has been free from the taint of slavery only since 1888, and has been a republic only since 1891. Consult Bryce, J., 'South America' (New York 1912). See bibliographies under History and other titles in the Brazilian series.

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5. EDUCATION AND RELIGION. The central government has been hitherto prevented by the constitutional restrictions already mentioned from making education compulsory in the states; but some of the latter have themselves taken this step, and wherever the government can offer it at all and make it free, education *is* free. Distributed unevenly throughout the states are more than 13,000 schools. Brazil has no university. The excellent schools of law, medicine and engineering in several of the large cities do not supply this deficiency. But all advocates of the establishment of a national university have encountered the opposition of leaders who represent the States' Rights doctrine. The founding and maintenance of a great national university, such as the country needs and would appreciate, are steps toward centralization which State politicians are wholly unprepared to take. The Union, however, occasionally extends pecuniary assistance to states, municipalities or individuals by way of co-operation in the maintenance of industrial schools, or colleges of agriculture. São Paulo leads among the states in educational progress: its Faculty of Law and Polytechnic College are both praiseworthy; and the range of scientific courses carried on at its museum is striking. However, this state does little for secondary education. It «contains three public secondary schools, one in the capital, one at Campinas and one at Ribeiraon Preto; but the pupils are few in number. There is a host of private schools, many of which are kept by religious orders. The private schools are for the most part boarding-schools,» many of them situated in the country. «The education given in such schools is very unequal and usually secondrate. Not only in São Paulo but throughout Brazil the question of secondary education is to-day one of extreme gravity. It is to primary education that the state of São Paulo devotes its resources. The budget appropriation is liberal, amounting to $2,000,000, and some of the schools have the appearance of palaces.» Mackenzie College at São Paulo has an excellent standing among foreign institutions which supplement by their work the state and national systems of instruction; and there are many foreign schools in the republic. The great educational value of free libraries has not been overlooked: there are many small collections of books; and the National Library in Rio de Janeiro, containing several hundred thousand items — perhaps nearly half of a million manuscripts and printed works — is the most interesting large collection that the writer has visited in any part of Latin America. Finally, as a field for educational endeavors, Brazil has elements of exceptional promise. «The Brazilians, who never forget that they were for a time, during the French invasion of Portugal, their own mother country, and head of the whole Portuguese people, cherish their national literary traditions with more warmth than do the Spaniards of the New World, and produce quite as much in the way of poetry and *belles-lettres* as do the writers of Portugal. They have a quick susceptibility to ideas, like that of Frenchmen or Russians.» Such is the tribute in Bryce's 'South America'; but it is promptly qualified as follows: «One can hardly be surprised that learning and the abstract side of natural science are undervalued in a country which has no university, nothing more than faculties for teaching the practical subjects of law, medicine, engineering and agriculture.»

Educational steps taken in recent years are (1) The decree of 5 April 1911, which conferred upon a Federal Board of Education authority to establish primary schools in the various states; (2) The inauguration, on 4 July 1913, of a superior school of agriculture and veterinary medicine at Rio de Janeiro; and (3) The decree of 15 April 1914, which created a class of practical schools of agriculture and which was followed by other decrees establishing preparatory schools of agriculture and experiment stations. Thus legal provision has been made for a system of agricultural education under the control of the central government. In 10 different, widely separated localities, this pacific invasion of the states by a movement unquestionably beneficial, though also unquestionably in contravention of strict-constructionist theories (see Government) has already taken place.

Religion in Brazil has been subordinated during so long a period that to-day the Church exerts little influence upon the thought and conduct of laymen. Colonel Roosevelt writes ('Through the Brazilian Wilderness') that «the Positivists are a really strong body in Brazil, as they are in France»; and again: «Brazil possesses the same complete liberty in matters religious, spiritual, and intellectual as we do.» But of course laymen in Brazil had never, in the manner of the Puritans, adopted an independent (Congregational) form of church government. The latter were free to exercise their own chosen form of worship; the former, when the connection between church and state was abolished and absolute equality declared among all forms of religion, quite naturally were freed from the restraints and the inspiration of religion to a very much greater extent. The Church has retained its buildings, properties and income; religious orders share fully in the general toleration; the Brazilian men as a rule are still nominally — and Brazilian women as a rule are devoutly — Catholics. High officials of the Catholic Church are:

The cardinal, at Rio de Janeiro, archbishops at Bahía, Rio, São Paulo, Pará and Mariana, and 25 suffragan bishops. Consult Report of the Commissioner of Education (Department of Interior, Bureau of Education, Vol. I, Washington 1915) and works by Bryce, Clemenceau, Denis and others in which are chapters dealing with present educational conditions. See bibliography under HISTORY.

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6. AGRICULTURE AND FOREST PRODUCTS. Coffee, rubber, herva matté, sugar and mandioca receive special attention on account of the importance of these Brazilian products; but the southern plateau in the states of Rio Grande do Sul, Santa Catharina and Paraná produces all the cereals and fruits of temperate zones and many of those of the tropics as well. We find here wheat, Indian corn, rye, potatoes and such vegetables as are grown in the United States; while rice, coffee, oranges, bananas and pineapples thrive in the lowlands along the coast. In many places grapes are grown and attention is given in the south to the production of native wines.

Coffee.— The great coffee-producers of the world are the Paulistas — the people of the state of São Paulo. The celebrated *terra roxa* (red earth) in which the coffee-trees flourish best is found in other parts of the republic, but the Paulistas were the first to demonstrate its extraordinary value for coffee-culture. «The history of what Linnæus named Coffea Arabica, in its long migrations from the wild forests of Abyssinia and Mozambique to the carefully cultivated *fazendas* of São Paulo, is a most interesting one. It is a far cry from its first restricted use as a drug in the East to its present status as one of the world's most popular beverages; from the time when its production in the West was prohibited and gave rise to as absurd conflicts as attended the introduction of tobacco into Europe. . . . It is scarcely 80 years since the production of coffee in the state of São Paulo received its first impetus. Before that time it was rarely found outside of a drug store. But after that the development of the industry was so rapid and so extraordinary that it stands forth as one of the marvels of economic history.» Of course the circumstance that in São Paulo the coffee-trees do not require shading (that is, are not, as in Porto Rico and parts of Mexico, etc., grown and cultivated under the protecting shade of larger trees) contributes to this «marvellous» success. «In 1851 the amount of coffee exported from São Paulo was something more than 100,000 sacks of 132 pounds each. Thenceforth the export of this staple increased with rapidity until, in 1896–97, the amount produced reached more than 15,000,000 sacks. This, with what was collected in other parts of the republic, gave Brazil 85 per cent of the world's total production. That year the state of São Paulo produced fully three times as much coffee as all the other states of Brazil combined. But this enormous crop was more than the market could bear. The supply had gone beyond the demand. The price of coffee fell until it threatened coffee-growers and the state itself with financial disaster. But the Paulistas were equal to the emergency. In order to support the market and to protect the coffee industry, they had recourse to the much criticized measure known as coffee valorization. The operation seemed like a gambler's risk, but there was so much at stake that the government of São Paulo did not hesitate to act. This measure achieved the end in view. They also began to direct their surplus energy into other channels, cultivating rice, cotton, etc., and planting such rubber-producing trees as manicoba and mangabeira; establishing new industries and devoting more attention to manufactures. The average annual coffee crop of Brazil is about 12,000,000 sacks of 132 pounds each. In 1915 the estimated produce was 9,497,553 sacks.

Cattle-Raising.— Cattle-raising in São Paulo is commented upon by Mr. Ling, in *The Americas*, November 1915: «From the time of leaving São Paulo city we passed through a gently rolling country; the characteristics are pastoral and agricultural. In the pastoral section fine bunches of native cattle and of crossbreeds between native and Hereford were seen in such quantities as to give the impression that the number far exceeds the generally accepted statement. Statistics show that the number of cattle, horses, sheep, etc., has more than doubled in the past 10 years.» Mr. Ling was informed by the large *fazenda* managers that increased interest was being given to cattle-raising. In 1913 there were in Brazil 30,705,080 cattle, 18,399,000 swine, 10,653,000 sheep, 7,289,050 horses and 3,208,000 mules. In July 1917 these had increased to a total of 80,330,000 head. As the returns are confessedly incomplete and as, in many states, it is customary to report only a part of the growth of stock, to avoid the payment of state taxes, the real figures may be taken as considerably larger than the official, which are based on the census returns for taxation purposes.

By a decree of 7 March 1917 The Swift Packing Company was authorized to carry on a packing business in Brazil under the name of the Companhia Swift do Brazil with a declared capital of $500,000 United States currency.

A modern slaughter-house and cold storage plant was erected in Santos in 1917 under the name of the «Companhia Frigorifica do Santos,» with a capital of $250,000 United States currency and working under a charter authorizing it to do business in cattle and meat and the products of its refrigerating machinery. It has a capacity of 500 head of cattle a day. Of late years there has been an appreciable diminution in the production of jerked beef in Brazil with the growth of wealth and the desire for fresh meats. This has opened up a very wide field for the packing-house. The impetus given to the refrigerated beef business in Brazil through conditions induced by the European War is shown in the exports of the month of January 1916 as compared with those of January 1917, the former being 2,593,180 pounds and the latter 15,142,322. All the exports of refrigerated beef in January 1916 were shipped through the port of Santos, while during the corresponding month of 1917 over 56 per cent of the exports were shipped through Rio de Janeiro.

Rubber.— Among forest-products, the first is rubber,— with respect to which a recent publication of the Pan American Union (see

Bibliography, 'Brazil,') etc.) says «India rubber, as it is generally called in textbooks and official reports, is a native of Brazil and grows wild there. Although efforts at cultivation have been successful with the seed in other countries, and even in Brazil, by far the greater part of the rubber exported from the republic is gathered from the forests of the northern interior of the country; no systematic preparation of the ground has ever been necessary and the entire care of the rubber gatherers has been given only to obtain the juice from the rubber trees and getting it to market. This essential factor of modern industrial life was utilized first by the natives of America and they found some place for it in their domestic economy as a waterproof covering for clothing, boats and their kind of bottles. Cauchu, or, in the aboriginal, cahuchu, from which comes the corruption caoutchouc, is the earliest word applied to rubber. The Brazilian speaks of borracha and this refers particularly to the product of the hevea, the rubber tree par excellence. It is indigenous to the region of the river Amazon and in the tributary areas of Peru, Bolivia, Ecuador, Colombia and Venezuela. Hevea is a large tree, of slow growth and long life. It has been found 12 feet in circumference. It requires low-lying, rich, deep soil and abundant moisture. It grows wild in Brazil, but not in clumps, being found rather scattered through the tropical forest, but it is well adapted to cultivation and has been planted in the East Indian Islands with success. Manihot produces the Ceará rubber of commerce, but its habitat is a high, stony and arid country. This also is native to Brazil, but in the region south of the Amazon. [Castilloa, next to Hevea the best known rubber producer, has its principal range in Central America and southern Mexico]. Other trees, shrubs and vines (lianas) yield rubber. . . . Rubber is not the sap but the cream from the juice, the milk or latex of these trees, shrubs and vines.» In 1915 the rubber crop was 36,750 tons and about 37,000 tons in 1916. The total exports of crude rubber from Pará, Manaos and Itacoatiara during 1916 amounted to 72,836,393 pounds. Shipments to the United States aggregated 48,874,578 pounds and to Europe 23,961,815 pounds.

After the opening of the European War the export of Brazilian rubber began to flow toward the United States in ever increasing quantities until, during the first quarter of 1917, the American market received more than two-thirds of the Brazilian output. During the months of March and April 1917 the exports of Brazilian rubber from the ports of Pará, Manaos and Itacoatiara to the United States was 9,918,412 pounds, while to all Old World ports it was only 4,633,774 pounds. In the following month 5,447,610 pounds reached the United States markets from Pará alone and an additional 2,243,206 pounds from Manaos, making a total of 7,691,037 pounds from these two ports as against 1,528,789 shipped to all European ports.

Maté.— Another forest product is the maté which to Brazilians is known as *herva matté* or *maté,* to other South Americans as *yerba* or *yerba maté,* and to foreigners as Brazil or Paraguay tea. The chief maté-producing state, that of Paraná, adjoins the great coffee producing state, São Paulo, and exports many million pounds of this Brazilian «tea» annually. The maté tree (in appearance not unlike a small evergreen oak or ilex with a heavy and fleshy leaf) grows freely in the forest, entirely without cultivation; and in the forest the leaves undergo, as soon as they are plucked, a first preparation which both diminishes their weight before transportation and also keeps them from fermenting. They are dried at a fire, and then packed in sacks which are sent to the mills at Curitiba which reduce the leaves to powder and separate the various qualities. Aromatic properties retained in the dried and powdered leaves are extracted by means of infusion. As a stimulating and wholesome beverage habitually used throughout a large part — especially the southern part — of the continent, maté might well be called, not by the competing names Brazilian or Paraguayan, but more simply the South American tea. The exportation of this South American tea, then, is to the state of Paraná what the exportation of coffee is to the vastly more important neighbor state, the basis, practically, of economic achievement. In 1915 yerba maté was exported to the extent of 75,885 metric tons.

Sugar.— But the basis of economic achievement in Brazil was formerly the exportation of a product the cultivation of which, on a large scale, was dependent upon slave-labor. Sugar, during a long period, held the position in the country's economic life now occupied by coffee, rubber and South American tea. At the present time the sugar-cane, besides being grown in the chief sugar centres, is a staple crop, commonly used for the production of an alcohol, or sometimes the crude variety of sugar called *rapa dura.* Sugar is no longer in the first rank of exports, however; and a study of its decline brings to attention the most interesting phase of the story of the manumission of slaves. Denis says that the planting of sugar created, as early as the 17th century, not only a long-enduring industry but also long-enduring wealth; and all over Brazil the cultivation of the sugar-cane was connected with slave-labor. As early as 1875 the decay of the sugar industry had become manifest in all parts of the country, and a severe drought hastened its downfall. Naturally there was a rapid fall in the market value of slaves. «At the same time the provinces of the south, which were then nearing the height of their development, could not obtain sufficient labor, and, while recruiting the first white immigrants, they made a last effort to renew their staff of slaves. There was thus a heavy exportation of slaves from the north to the south.» Now, «as has often happened, the institution of slavery, made less harsh by custom, did not arouse public opinion; but the spectacle of a commerce in slaves did violently arouse it. The departure of those human cargoes for the south was regarded with indignation.» The abolitionists succeeded in rendering such shipments impossible; and then the value of the slaves, for whom there was no adequate employment, decreased rapidly. «When their enfranchisement was determined upon it was possible to buy them out at reduced prices; less on account of the violent propaganda of the abolitionists than because [so many of] the sugar plantations had disappeared.» In 1915, 59,074 metric tons (2,204.6 lbs.) of sugar were exported from Brazil.

Wheat.— Brazil has plenty of wheat lands but few of them are used for wheat growing. Yet where experiments have been tried of growing wheat on the Brazilian uplands, more especially in the southern states, they have proved successful. Brazil imported, in 1916, flour and wheat to the value of over $60,000,000; yet official investigation made in that year showed that pure wheat bread is a thing practically unknown in Brazil, where the bakers adulterate the wheat flour with mandioca, bread-fruit flower or corn-meal. Mandioca is the most common adulterating mixture for the making of «Brazilian bread,» which «generally consists of mandioca and wheat flour in about equal parts»; though often the proportion of the former is greater than the latter. Were the law to insist on the bakers selling pure wheat flour bread, Brazil would require to grow, to supply her own needs, wheat to the value of from $60,000,000 to $100,000,000 per year at the prices prevailing in 1916.

Vegetable Oils.—Already in 1917, the state of São Paulo, which had previously been a heavy importer of vegetable oils, had reached a position where it had begun to export these oils instead of importing them. Several mills had been established, one of them of large capacity and most modern type, for the manufacture of cotton-seed oil. Previous to the establishment of these mills most of the cotton seed from the 1,000,000 bales or more raised annually in the country was left to rot in heaps where it had been extracted from the cotton. Already large shipments of Brazilian cotton-seed oil had been made in 1917 to Argentina, where it brought, in the market, the same prices as the best foreign oils. In 1913 the state of São Paulo imported 2,304,823 pounds of cotton-seed oil, and in 1916 only 244,794 pounds. The problem before the oil manufacturers in 1917 was the getting of the cotton seed to the mills from the widely distributed cotton territory which is yearly extending itself. Castor oil is another business which has already begun to interest the manufacturers of vegetable oils in Brazil. Several castor mills were in operation in the state of São Paulo in 1917, and orders had been placed in the United States for an extensive modern castor mill for the city of São Paulo. The castor bean grows well over a considerable part of Brazil, and the oil from most of the castor districts is good.

The growing of flax is on the increase in Brazil, the state of São Paulo taking the lead in this as in other oil products. In 1917 several factories had already turned their attention to the production of flaxseed oil and were also experimenting with peanuts for their oil qualities. In Brazil peanuts grow luxuriantly and are of a peculiarly oily quality. The crop is abundant for six months in the year and the beans can be handled by the same machinery used to manufacture the castor bean and other oils. Brazil possesses many oil-bearing nuts, all of which have as yet been little exploited. Among these are the cashew, ucuba, copra and babasu. Some of these are already used in the manufacture of soap.

Beans.— No other Brazilian crop increased in such relatively large proportions as that of the brown or black bean from 1914 to 1918. In 1914 there was practically no exportation of Brazilian beans and the bean crop of São Paulo was only worth $6,700 in 1915. But São Paulo produced for export beans valued at $2,204,000 in 1916, out of a total bean crop of $3,500,000 exported. About three-fourths of this went to the United States. As Rio de Janeiro handles the constantly increasing bean crop of the agricultural colonies of the Brazilian Railway Company and other colonies in the states of Paraná, Santa Catharina and Rio Grande do Sul, she had already, in January 1917, outdistanced other Brazilian ports in bean exports. The rapid increase in the exportation of beans from Brazil is shown in the following table:

Year	Pounds
1914	9,770
1915	607,549
1916	100,299,667
1917 (5 months)	127,785,528

Other Important Crops.— The cultivation of cotton, cacao and tobacco may be said to increase very gradually, in view of the extent of the country and the excellence of the products. The wool crop exported reached 4,198,630 pounds in 1912 and was valued at $571,276. In 1915 it fell to 997,630 pounds valued at $193,065. Cotton is grown principally in Pernambuco, Parahyba, Rio Grande do Norte, Ceará, Alagoas, Maranhao, Sergipe, São Paulo and Minas Geraes. The average cotton crop in recent years is close to 1,000,000 bales of 176 pounds each. Exports of cotton have decreased as the home consumption has increased. Mandioca, or farhina de mandioca, primarily the food of aborginal tribes, has been to such an extent cultivated that mandioca flour has become actually the staple food of Brazilians. The Pan American Union's ‹Brazil,› mentioned above, says: «It is a shrub about four feet high which has been induced to change its root into a veritable tuber. In its raw state mandioca is an irritant, not infrequently a deadly poison, but properly prepared it becomes a richly nutritive food, esteemed by Brazilians high and low, and forms a staple for bread throughout the country. All Brazil grows the plant, but it is used chiefly along the littoral and on the lower plateaus. From June to September is the best planting season, the root being gathered eight months to two years afterwards.» Great care is exercised in treating it in such a way that the poisonous starchy contents shall be changed into healthful and edible starch. The natives are most expert in their methods of doing this; and they cannot be regarded as procrastinating workers, inasmuch as in the course of a single day — the day on which the tubers are gathered — all the various processes of grating, desiccation and roasting must be completed.

The question of labor, which affects agriculture and the manufacturing industries alike, will be briefly discussed, as we pass from the former subject to the latter. Brazil's achievements, commendable though they seem in certain respects, are still almost as nothing compared with agricultural possibilities in a region so vast and singularly favored by nature. The Brazilians realize and admit their long continued neglect of wholly exceptional opportunities; and in 1916 showed that they had been stimulated to renewed efforts by the withdrawal of food supplies formerly received from Europe and by other war conditions.

Bibliography.— *The Americas* (New York, published monthly, 1914–18); Grossi, V., ‘Storia della Colonizzazione Europea al Brasile e della Emigrazione Italiana nello Stato di S. Paulo’ (Milan, Rome, Naples 1914); Pan American Union, ‘Brazil: General Descriptive Data’ (Washington 1915); ‘Year Book, Brazilian’ (Rio de Janeiro). See also studies of this subject in the books by Denis and Walle mentioned in other articles of the Brazilian series.

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7. COMMERCE OF BRAZIL. The new civil code of Brazil which went into effect on 1 Jan. 1917 contains numerous provisions favoring certain classes of American business. Mr. O. P. Austin, after referring to improved commercial conditions in South America generally in 1915, writes (in *The Americas,* Vol. II, No. 2) that the improvement was less sharply marked in Brazil than in Argentina «by reason of the fact that prices of the articles which form Brazil's chief exports, coffee and rubber,» were lower in 1915 than in 1914. Reports covering the seven months ending with July 1915 showed, as the total value of the exports for those months, $132,800,000 against $149,500,000 in the same months of 1914. Imports for the seven months amounted to but $81,000,000. against $130,000,000 in the corresponding period of 1914, and $199,000,000 in the same months of 1913. «Details of the trade of Brazil, like those of Argentina,» Mr. Austin continues, «are more favorable to the United States than to the other countries, especially in imports. The United States is, in fact, the chief country from which the imports show an increase. The total value of imports from the principal countries for the six months' period ending with June 1915 are, from Great Britain, $15,375,000 against $25,850,000 in the same months of 1914; from Germany, $1,875,000 against $23,700,000; from France, $3,230,000 against $10,123,000, while from the United States the total for the six months of 1915 was $18,250,000 against $16.300,000 in the corresponding period in 1914. Exports in the six months ending with June 1915 are, to Great Britain, $17,957,000 against $21,500,000 in the same months of last year; to France, $13,180,000 against $11,970,000; to Holland, $11,290,000 against $7,100,000, and to Norway, Sweden and Denmark, $13,400,000 against $1,400,000. To the United States, the exports of the six months of 1915 are $44,500,000 against $49,500,000.» The total value of the foreign commerce of Brazil was, for 1912: $671,038,586 (imports, $308,243,736 and exports $362,794,846); for 1913, $641,593,196 (imports, $326,428,509 and exports, $315,164,687); for 1914, $387,026,430 (imports, $165,556,950 and exports, $221,469,480); and the tendencies of the country's foreign trade when effects of the European War were most keenly felt are seen when these figures are placed in immediate connection with those relating to 1915, as given above. The depression and the reasonably prompt reaction are full of interest. We add now observations made during a longer period, namely, 10 months, in 1915, which show a large increase in the proportion of Brazilian trade held by the United States:

In 1913, 1914 and 1915, respectively, the United States took 32 per cent, 40 per cent and 41 per cent (in value) of Brazil's exports. In the same years 16 per cent, 15 per cent and 29 per cent, respectively, of Brazil's imports were drawn from the United States. Thus, the share of the United States in Brazil's total purchases nearly doubled in 1915.

Official statistics of Brazil's foreign trade for January–September 1916 give the value of the imports during that period as $137,858,200, contrasted with $106,683,400 for the first nine months of 1915 and $149,542,675 during the first nine months of 1914. Exports totaled $187,160,725 in January–September 1916, against $173,446,925 and $168,726,425 for the same period in 1915 and 1914 respectively. The principal exports for the 1916 period were: coffee, $96,035,500; rubber, $26,507,825; hides, $12,570,175; cocoa, $9,041,950; tobacco, $6,822,825; yerba maté, $6,686,575; manganese, $5,664,600; frozen meats, $5,275,275, and sugar, $4,019,725. The total imports of wheat flour into Brazil for the first six months of the calendar year 1916 were 143,104,300 pounds, valued at ports of shipment as the equivalent of $4,155,743 United States gold. Of this total quantity Argentina and Uruguay supplied 81,754,134 pounds, value $2,123,205, and the United States, 59,783,684 pounds, value $1,967,317.

The rapid increase in the frozen-meat industry and the permanent character of this development are clearly shown by the following figures of exports for the first 11 months of 1916 as compared with the corresponding months of 1915: In 1915, 14,686,280 pounds, valued at $1,159,291, were exported; in 1916, 71,268,556 pounds valued at $6,606,732. Of this total of 71,268,556 pounds 30,832,904 pounds were exported from the port of Rio de Janeiro and 40,435,662 pounds from the port of Santos. The destination of this meat was: To United States 5,469,220 pounds; France, 9,779,853; Great Britain, 11,935,748; Italy, 33,446,732; Gibraltar (to order) 10,637,013 pounds. Preliminary data of the republic's commerce for 1916, recently issued by the Brazilian Statistical Bureau, give the value of the exports as $267,706,000 (United States currency) and that of the imports as $196,057,000, making a total foreign trade of $463,376,000, which is larger than in either of the two preceding «war years.» The balance of trade ($71,649,000), however, is lower than in 1915, because of increased importations during the following year.

The statstical details of Brazilian trade for 1915 show the change in proportional representation of the United States, England and Germany in Brazil's inbound and outbound commerce as follows:

IMPORTS	1914	1915
United States	17.5 per cent	32.1 per cent
England	23.7 per cent	21.9 per cent
Germany	16.1 per cent	1.5 per cent
EXPORTS	1914	1915
United States	40.9 per cent	41.7 per cent
England	14.4 per cent	12.1 per cent
Germany	9.9 per cent	....

The exports of the chief products of Brazil were:

	1913	1914	1915
Cotton, tons	37,424	30,434	5,228
Sugar, tons	5,367	31,860	59,074
Rubber, tons	36,232	33,531	35,165
Cocoa, tons	29,759	40,767	44,980
Coffee, 1,000 bags	13,267	11,270	17,061
Hides, tons	35,075	31,442	38,324
Tobacco, tons	29,338	26,980	27,096
Herva matté, tons	65,415	59,354	75,885

The adverse exchange situation cut down Brazil's receipts for her commodities. The value of her money, in commerce, decreased. Her exports, measured by quantity, were larger than those of 1913, but she got only $265,000,000 (in round numbers) for all of them, against $320,000,000 in 1913, although in her own markets, commodities ruled generally higher, and she paid much higher prices for what she imported. Consult *The Americas* (New York 1914–17); 'Brazilian Year Book' (Rio de Janeiro); Pan American Union, 'Brazil' (Washington 1915); Filsinger, E. B., 'Exporting to Latin America' (New York 1916). See general bibliography under HISTORY.

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8. MANUFACTURING AND MINING.

Labor.— Labor problems, with good reason and in a very special sense, claim the attention of all who would study intelligently the present conditions of Brazilian agriculture and manufacturing industries. The government, in order to encourage immigration from Europe, guarantees free passage and a homestead to bona-fide settlers, the ultimate aim being to build up a class of peasant proprietors whose services may, at least in part, replace the migrating hordes of landless workingmen. In the northern states of Amazonas, Pará, Maranhão, Piauhy, Rio Grande do Norte, Parahyba, Pernambuco, Alagôas and parts of Matto Grosso and Goyaz, a large part of the food must be imported or brought from the southern states, paying high freight rates. The cost of living is, therefore, high and labor correspondingly expensive. In the central states labor is more abundant, the cost of living is not so high, and naturally there is a lower rate of wages. In the three southernmost states the lowest rate of wages prevails; labor there is both plentiful and satisfactory; a large part of the working class is of Italian or German origin. In Brazil, as in Latin America generally, skilled labor, workmen of experience in mechanical industries, are scarce. «New industries are nearly always started with imported labor under contract, the foreign foreman having to train men for the work which they are expected to do. This is noticeably the case in the textile industry, which is largely manned by English or other contracted foremen and headweavers. The lighter work of these factories to a large extent is carried on by women.» For the erection of large machinery «it has always been the practice for the contractors to send their own engineers and skilled mechanics. In most cases the buyer contracts with the machinery-maker for the permanent service of one or more competent mechanics.» Graduates of those public institutions in Rio de Janeiro, São Paulo and other large Brazilian cities in which the skilled trades are taught have seldom been appointed to the highest positions in the factories. «The Brazilian agricultural laborer is generally the descendant of slaves or an Indian half-breed, and although ignorant is a fairly good worker.» It has not been found convenient, as a general rule, to entrust the Brazilian laborer with the running and care of machinery because it is a business to which he has never been trained. Yet Latin America has produced excellent engineers, and trained natives are being successfully employed as engineers of locomotive and stationary engines on railways, in factories, on plantations, in mines and electric-light plants where these are owned and operated by natives.

Manufacturing Industries.— The restrictions indicated in the foregoing paragraph are, to some extent, offset by the determined efforts of national and state governments, with the co-operation of foreign investors. Resultant achievements, although actually small for a land so great and naturally so rich, have nevertheless attained proportions which surprise visitors from the north. The manufacturing industries of the country as a whole are varied and constantly increasing, and every city of importance in Brazil has its manufacturing plant of one kind or another. It is only 20 years since the first Brazilian textile mill was started. This industry has increased remarkably in the two decades, owing to improvement in machinery and to new transportation facilities which bring the mills, the cotton-fields and the consumers closer together. «In most of the large cities the necessities of domestic life are made in factories, and foundries for simple metal-work exist, but, as a rule, complicated machinery, preserved foods and the so-called luxuries are still imported. The textile industry is perhaps making greater progress than any other. Five of the larger cotton mills in the Federal district employ 8,000 operatives and have a yearly output of over 80,000,000 yards. Another mill employs 1,500 operatives and utilizes 1,500 horse power. Four mills in Petropolis manufacture an average of 18,000,000 to 19,000,000 yards, while 24 mills in São Paulo produce 83,00,000 to 84,000,000 yards. In the district of Rio de Janeiro the establishment of new and the enlargement of existing factories have caused the Rio de Janeiro Tramway, Light and Power Company to enlarge its plant from 50,000 to 80,000 horse power to meet the increasing demand.» São Paulo compares favorably with Rio de Janeiro in industrial importance. In addition to the power plant of the São Paulo Tramway, Light and Power Company at Parahyba, which has a capacity of 32,000 horse power, the construction of a new plant of 62,500 horse power was begun several years ago for the purpose of supplying additional power to the city of São Paulo and neighboring towns and cities. The importation of modern American machinery has given a new impetus to the lumber industry in the state of Paraná, where large saw-mills have been recently erected. Brazil produced in 1915 linen to the amount of 66,632 metres of crude textiles and 223,265 of finer dyed textiles, for the manufacture of the greater part of which the raw material was imported. However, under the encouragement of the government flax growing has already begun in the southern part of the republic where it gives signs of being able within a few years to supply the home demand. Linen weaving is carried on in Brazil principally by the cotton factories; but one large factory, Companhia Tecido de Linho Sapopemba, is devoted altogether to the linen industry.

Mineral Resources.— Brazil's mineral resources have from the first been questioned, doubted. Amerigo Vespucci navigated, in the course of his third voyage, from 5° below the equator to a region well south of the Tropic of

Capricorn, practically from Rio Grande do Norte to Rio Grande do Sul, as the regions are now called. He wrote as follows: «On this coast we saw nothing of value except an infinite number of dye-wood and cassia trees, and those which beget myrrh and other wonders of nature which cannot be recounted. . . . And seeing that in this land we found nothing whatever of mineral wealth, we decided to hasten away.» Better luck in this respect attended the efforts of the 18th century explorers; but such thorough exploration and exploitation as took place in the Spanish South American holdings was impossible in the Portuguese; and regions suspected of concealing mineral treasure have remained in a measure mineral regions «of doubt.» D. A. Vindin (in Denis's 'Brazil,' English version, supplementary chapter) writes that, although there is official record of the production of gold valued at more than $500,000,000 and of diamonds to the value of many millions; and although Brazil also produces silver, platinum, lead, copper, iron, manganese, mercury, coal, monazite, graphite and many varieties of precious stones and rare marbles; nevertheless the mining industry adds very little to the country's wealth at present. «I have no doubt,» he says, «after having made a visit of inquiry and looked up all available information, but that Brazil will, within a few years, demand considerable attention from mining men, as there are few countries in which there are greater opportunities for profitable investment. Hitherto very little attention has been given to mining by either the Federal or state governments, with the exception of the state of Minas Geraes, the result being an absence of much-needed mining laws for the guidance of those wishing to engage in mining on business lines. I understand that there is a likelihood of the states waking up to the importance of encouraging the development of their latent mineral wealth. Most of the gold won by the early settlers in Brazil came from the banks of rivers or from near the surface of the soil. The amount of development of reefs at any (considerable) depth has been very slight, and it is this work in the future that promises well. It is the need of capital and the necessity of waiting for returns that disincline the Brazilians to undertake mining operations; it is consequently to European and American investors that the work will fall. The fact that most of the mining lands are the property of private owners, and that, under the Federal and state constitutions, all minerals are the property of the freeholders and not liable to any government tax, renders any systematic searching or prospecting for minerals almost of no avail. The owners of these lands are not sympathetic toward mining at the present time; they will not themselves mine and they will offer no aid to others; in fact, in most cases, mining prospectors would be warned off the ground as trespassers. There appears to be an almost unlimited scope for profitable mining in Minas Geraes; but it is at all times difficult to obtain the right class of men to conduct operations; and in a country like Brazil the success or failure of any mining venture largely depends upon the type of man in charge of affairs. Apart from technical ability, a knowledge of the language and the people and unfailing patience and tact are necessary.» The facts that in Minas Geraes gold has been mined profitably since 1830, and that Rio Grande do Sul is the scene of recent gold-mining enterprises are mentioned; then the account deals with iron in the following terms: «A number of eminent mining engineers from the United States, Canada and Europe have visited Brazil in order to examine and report upon the iron deposits of the country, which are considered to be the richest and greatest in the world. The ores are mostly oxides; the carbonates are rare and usually associated with carbonate of calcium.» They occur in «practically all that portion of Brazil lying south of 15° S. In Minas the ore is in some cases found in actual mountains, the analyses of which have yielded extraordinarily high percentages. Coal exists in Santa Catharina and Rio Grande do Sul at various places.» Deposits of talc and kaolin are of frequent occurrence in crystalline rocks, which are of wide distribution in Brazil. Some of these, more favorably situated in relation to transportation and markets, are now being worked. Of these are the following: (1) Near Rezende, state of Rio de Janeiro, a pure white talc, requiring little treatment before being available as a cosmetic. (2) Near Lorena, state of São Paulo. (3) Near Santo Amaro, state of São Paulo, not far from the city of São Paulo. Massive talc, or steatite, occurs in different parts of the country, as near Itaberaba, municipio de Ouro Preto, Varzea near Dores de Boã Esperança, and near Jacuhy in the western part of Minas Geraes. At these places its principal use is in the manufacture of cooking utensils, which are turned out on the lathe from the solid block of soapstone. Pans and pots of this material are specially prized in Brazil for cooking rice. It also occurs in Ceará and Goyaz.

Classed between common bituminous and the lignite of Germany, Brazilian coal contains ash and impurities (20 per cent) and in specimens examined, sulphur. «Reports on different samples show that this coal, when made into briquettes, is little inferior to Cardiff coal in the same form.»

In the Jacuhy district, in the state of Rio Grande are vast deposits of coal. In August 1917 the Central Railway of Brazil opened a large crushing plant at Barra do Pirahy at a cost of more than $500,000, with a view to reducing this native coal to a commercial commodity. As the experiment was a success, it is expected to give an added impetus to coal-mining in Brazil. In addition to the large coal mine at Jacuhy, which is in part owned by the government, there is another large mine at São Jeronymo. The latter mine, which is only 12 miles from river transportation, has its own railway to bridge the distance; and the government was constructing, in 1917, a railway 37 miles long to give similar facilities to the Jacuhy coal district, which was producing 12,000 tons a month toward the close of 1917, with the prospect of a very considerable increase of this output in 1918.

By an executive decree of 23 May 1917 the Brazilian government authorized the Minister of Transportation and Public Works to enter into a contract with the São Paulo–Rio Grande Railway Company for the construction and lease of a railway line from some point on the branch line Paranapanema to the coal fields in the valley of the Peixe River, tapping on the way the coal fields of Barra Bonita, in the state of Paraná. The contract called for the completion of the road in one year. When completed it is to be under the control of the government. In the same month the government also made a contract with the same company for the construction and lease of a railway 50 miles long from Port Tubarão to the Ararangua in the state of Santa Catharina. The contract provides that the road shall also be in operation in one year from date of contract.

The high price of coal in Brazil has helped to retard industries of various kinds and forced the railroads for the most part to burn wood wherever available, because the native coal, in lump, does not burn well in the engines; but the recent experiences in crushing it have proven that, in its crushed state, it answers all the purposes of foreign coal; so other crushing plants were being planned in the fall of 1917. Since the development of the Kimberley mines in South Africa, diamond-mining in Brazil has received comparatively little attention; nevertheless valuable stones are often found and «it must be borne in mind that Brazilian diamonds are considered to be of much finer grade than those from South Africa.» Brazil produces some of the finest specimens of beryl; amethysts and agates are also plentiful. Consult ‘Brazilian Year Book’ (Rio de Janeiro) and Denis, P., ‘Brazil’ (trans. Miall, London 1911). See general bibliography under HISTORY.

MARRION WILCOX.

9. BANKING AND FINANCE. The principal banks in Brazil are: Banco do Brazil, Banco Nacional Braziliero, Branch of the National City Bank of New York, British Bank of South America, Limited, Brasiliansche Bank für Deutschland, London & Brazilian Bank, Limited, London & River Plate Bank, Limited, Banco Español del Rio de la Plata, Banco Commercial do Rio de Janeiro, Banco Allemâo Transatlantico, Banco do Commercio, Banco do Estado do Rio de Janeiro, Banco Nacional Ultramarino. All of the foregoing are in Rio de Janeiro; the Banco Francesco é Italiano per l'América del Sud is in São Paulo. The monetary system is nominally based on the gold standard. The milreis, the gold unit, which is divided into 1,000 reis, weighs 0.89645 grammes of gold .917 fine, or .82207 grammes of fine gold, and its par value in terms of the currency of the United States is $0.5463. One dollar, currency of the United States, is therefore the equivalent of 1$831 gold milreis. The reader will notice that the sign $ for milreis is placed *after* the units and *before* the decimals. The circulating medium, and the only legal money in Brazil, consists of government notes guaranteed redeemable at the rate of 16d. per milreis. This rate is maintained through a conversion fund known as the Caixa de Conversão (Compare: ARGENTINA — *Banking*). The theoretical unit of the paper circulation represents 0.48816 grammes of fine gold, and its equivalent in terms of the currency of the United States is $0.32444. The par value of $1, currency of the United States, is therefore 3$08226 expressed in terms of Brazilian paper currency. The method of quoting exchange rates in Brazil under normal conditions (consult ‘Latin American Monetary Systems and Exchange Conditions,’ by Joseph T. Cosby) is the following:

90 D/S	
London	16–3/32d.=1$000
Berlin	1 Mark= .730
Paris	1 Franc= .593
Sight	
London	15–7/8d.1$000
Berlin	1 Mark= .740
Paris	1 Franc= .600
New York	$1.00 U. S. Cy.=3$113

Exchange fell to 14d. on receipt of the news of the outbreak of the European War. A bank holiday (15 consecutive days) was declared, specie payment was suspended by the Caixa de Conversão, and the rate of exchange remained at 14d. (more or less nominal) until the banks reopened on 18 August. After that date the rate declined steadily until early in October, when a low point of 10d. was reached. The principal factors in bringing about this heavy decline were: First, the action taken by the Caixa de Conversão, second, the closing of London credits in favor of Brazil, and, third, the fact that the government authorized an issue of treasury notes amounting to $81,120,000 or 250,000 contos (one conto = 1,000 milreis; 1,000 milreis = $324.44 currency of the United States). During February 1916, the rate for bankers' 90 days' sight drafts on London varied from 11 7/16d. to 11 15/16d., the closing rate on 29 Feb. 1916 being 11⅞d., as compared with 11½d. on 31 January. The rate for 90 days' sight commercial bills was 11¾d. on 24 April 1916.

By executive decree, promulgated 23 Dec. 1916, the exchange of the notes of the Caixa de Conversão (Conversion Office) for gold was to continue suspended until 31 Dec. 1917, exception being made in favor of the exchange of notes by order of the government to attend only to the service of the external debt of the Union.

The aggregate cash balances of the principal banks in Rio de Janeiro at the end of February 1916 showed a decrease of about $1,325,000 as compared with those at the end of January. Discounts during February in the same year showed an increase of $265,000, approximately. The rate obtainable for first class paper was about 7½ per cent. The Federal Treasury 6 per cent (paper) bills commonly called «sabinas,» issued in 1915, commenced to fall due. The government availed itself of its option of renewing the bills for one year, paying interest in cash. Custom House receipts, both at Rio and at Santos, showed an increase for the first two months of 1916 as compared with the same period in 1915. The commercial situation in São Paulo, 15 March 1916, was reported to be very sound. The large commercial houses in England and the United States who sent out agents discovered that the difficulty was rather in the execution than in the obtaining of orders. Credits of three or four months were given, whereas, a year before, practically all business was done on a cash basis. The question of tonnage continued to absorb attention, freights remaining very high. The greater part of the shipments went to the United States. Cotton mills reported progress, several companies showing comparatively prosperous situations.

Brazil in 1915 confronted the absolute necessity of mending the national finances, but declined to make the mistake of marking up taxes and imposts on the supposition that higher charges would necessarily produce greater revenue. During the five years, 1910 to 1914, inclusive, every year had brought a deficit of increasing size. Excellent judgment was shown by those who favored the lowering of export duties and the reduction of the rate of port-charges exacted by companies having concessions for operating port-works, the position being taken that Brazil's products should be allowed to compete effectively in foreign markets with those of other lands. At this time it was stated that the general expenses of moving goods through certain Brazilian ports were five times to twenty times greater than those of moving goods through North American to European ports.

The Brazilian budget law for 1917 estimated the general receipts at 116,310,204 gold milreis ($62,807,510) and 327,300,333 paper milreis ($78,552,080) ; the revenue with special application was placed at 12,025,000 gold milreis ($6,493,500) and 12,838,000 paper milreis ($3,081,120). The total revenue, when expressed in American currency, showed an increase of $7,365,839 over 1916. The budget law fixed the expenses for 1917 at 98,532,945 gold milreis ($53,207,790) and 407,426,730 paper milreis ($97,782,408), showing a deficit of $55,995 for the year, and an increase of $8,169,205 over the expenses of 1916.

The European War did not by any means originate the critical depression. The withdrawal from Brazil of British supplies of capital in the Balkan money stringency (1913–14) had occasioned a financial revulsion before the shock of war was added. «Brazil was feeling the depression badly in the first six months of 1914,» says a writer in *The Americas* (Vol. I, No. 8, page 33). «The foreign trade of Santos port, which is typical of all Brazil, showed a decline of 44½ per cent in imports for those months as compared with the corresponding period of 1913, and the second half of the year showed a drop of 60⅓ per cent as compared with the corresponding period of 1913. In exports, the decline of the first half of the year had been only 6½ per cent. The drop in the second half — the war period — was 48.2 per cent. Very heavy declines in the imports of machinery of all kinds (60 per cent) show the effect of the cutting off of the European capital supply»— that is, Continental as well as British. Moreover, Brazil's chief commodities held a less controlling position in the markets of the world at that time. «Plantation rubber undercut in price the wild rubber of the Amazon. Coffee dropped sharply in export price from 1912 on. In 1914 it was nearly 40 per cent below the 1912 price.» In view of the hard facts that the Federal government had large debt maturities and that its revenues (chiefly derived from imports) had fallen off nearly one-half, owing to the derangement of trade resulting from the war, there was nothing to occasion surprise in the circumstance that a settlement was made with the holders of Brazilian securities by which the maturities were extended for 13 years.

Credit was then granted only with the greatest reserve. «The Federal, state and municipal governments figured in the mercantile credit situation very gravely because it was necessary during the most critical part of the months just subsequent to the declarations of war for these to extend official help to the general situation and to finance the orderly continuation of their (own) necessary activities through reciprocal mercantile credits. The government was said to owe about $75,000,000 distributed among leading business houses over the country, and these were severely handicapped by its inability to settle accounts in a way to permit them to realize without loss of principal. The Rio de Janeiro Chamber of Commerce held several largely attended meetings in which protesting resolutions were sent to the government, against the latter's payment of local accounts for supplies in treasury notes when these could not be disposed of at more than 75 per cent of face value. . . . Professional and party politics were as active in Brazil, and with the same effects, as they have been during like trying times in the United States. It was, however, gratifying to note a distinctively forward movement in which ‹measures, not men› were increasingly sought for by a very important section of the population. Production, with a view to export, was the problem toward which all eyes were turned as being the chief hope of the Republic. The remarkable part which Argentina has been called upon to play since the outbreak of the war, as a supplier of wheat and frozen meat to the rest of the world, has not been without its lesson.» The depreciation of Brazilian paper money in exchange transactions proved to be highly disadvantageous to her. Thus, the official statement of the republic's imports and exports during the first five months of 1915, issued by the Director of Commercial Statistics, Ministry of Finance, shows the largest credit balance Brazil has had in foreign commerce in five years. But, although 7,095,000 bags of coffee were exported, as against 4,643,000 in the corresponding period of 1914, and in paper currency of the locality the total value was 253,657 contos, as against 190,328 contos, the actual value when converted into United States currency was only $68,155,000, as against $63,445,000 the year before. The domestic price of rubber was higher in terms of the paper currency, but the amount credited in exchange was only $15,665,000 against $20,720,000, a drop of 25 per cent.

In ‹Proceedings of the First Pan-American Financial Conference› (Washington 1915) is a summary by Hon. John Bassett Moore of a very full Brazilian report dealing with the financing of transactions involving the importation and exportation of goods, with local and commercial banking and with various questions of trade and of commerce. It recommended that greater prominence should be given, in the public schools and other educational institutions of the United States, to the study of the Central and South American countries, their geographical location, natural resources, government and languages; that emphasis should be given to the necessity of greater liberality in the interpretation of customs regulations by the United States and Latin America; and it calls attention to the need of more effective protection of trade-marks, of the facilitation of reciprocal business relations between merchants and manufacturers of the United States and of those of Latin America. It urges the granting of such reasonable credits and business information in both directions as may be safe and desirable. It advocates the establishment of a system of direct exchange between the United States and Latin-American countries based on the dollar unit of the United States; and, in order to facilitate the interchange of products adapted to the needs of American countries, the formation of bureaus of standards of the respective countries, to standardize, in so far as possible, the requirements of each country; the extension of reciprocal tariff concessions between the United States and Latin-American countries (such concessions as characterized the Cuban reciprocity treaty), and the inauguration of a rapid, frequent and dependable marine transportation service, to provide adequately for the maintenance and development of commerce between the countries of North, Central and South America. It affirmed that the postal rates existing within the United States should be extended to include the Latin-American countries and made reciprocal, and that a general international parcels-post and money-order system should be established, and direct telegraphic service, wireless or cable, should be made between all parts of North, Central and South America under the exclusive ownership and control of and operated by American interests. The report also advocates the establishment of a more comprehensive and reliable international system for the exchange of important news by and to the press of all the interested countries.

Budget deficits had become chronic in Brazil previous to 1914, on which date an attempt was made to relieve the situation by floating a new loan in Europe, but the European War rendered this attempt a failure and Brazil was forced to default in payments due on her foreign debts. Two months later a funding scheme was carried through with the co-operation of the Rothschilds, by which the interest of 12 of the 18 foreign loans was funded for three years and the sinking funds on them and another loan were suspended for 10 years more. These 12 loans comprised over 90 per cent of the external debt, which, by this funding arrangement, was very considerably increased. This was followed by a reduction in the expenses of the government and an increase in taxation was made. The tariff was so modified as to encourage imports where, in many instances, the old tariff had had the contrary effect. Thus the budget deficit of more than $63,000,000 was reduced to $38,000,000 in 1915 and to an estimated $9,000,000 in 1917. By a decree of 9 May 1917, the Brazilian government issued an additional 20,000,000 milreis ($4,800,000) of treasury notes, thus making a total of $75,600,000 issue of the $84,000,000 authorized on 28 Aug. 1915 to meet the deficits of the budget, to provide aid and preventive measures against drought and to assist the Banco do Brazil with funds at 3 per cent to develop its operations. On this date the amount of paper money in circulation was 1,157,527,725 milreis ($277,806,650). This had been increased by September 1917 to an equivalent in milreis of $319,025,985, United States currency. On 31 Dec. 1916, the external Brazilian debt was $533,577,000 United States currency, and the consolidated internal debt $216,000,000. This had increased to $220,498,425 by 1 April 1917. On the latter date the treasury reserve was somewhat more than $15,000,000 gold. The foreign trade balance in favor of Brazil was, for the first quarter of 1917, $76,000,000, while the imports show a steady increase since 1915. In 1916 this increase was over 30 per cent, and that of the first quarter of 1917 was 52½ per cent above the income for 1915. The state of São Paulo profited more than any other part of the country by this prosperity, its exports being nearly one-half of the total exports of the republic.

In 1916 the Brazilian government redeemed gold bonds to the value of $17,000,000, leaving a balance of $7,000,000, out of the $24,000,000 overdue, still to be redeemed.

In 1917 the state of São Paulo led the way in the establishment of state savings banks in São Paulo, Campinas, Santos and Ribeirão Preto with the avowed object of encouraging the people of the state to save and invest their savings. The main savings banks above mentioned are empowered to establish, in conformity with the provisions of the law, branch banks throughout the state as occasion may require. The investment of the deposits in these savings banks is carefully restricted and safe-guarded by law. These are the first savings banks established in Brazil on a practical basis. As early as 1860 Federal savings banks were in operation, but as these were in reality dependencies of the public treasury, the regulations governing their investments never invited public confidence, so they failed to accomplish the end of their being.

Bibliography.—‘Financial Conference, Proceedings of the First Pan American’ (Washington 1915); ‘Long Credits and the New Banking Act’ (reprinted from ‘Bulletin’ Pan American Union, Washington); Lough, W. H., ‘Financial Developments in South American Countries’ (Washington 1915) and ‘Banking Opportunities in South American Countries’ (Department of Commerce, Washington 1915). For currency, etc., consult Cosby, J. T., ‘Latin American Monetary Systems and Exchange Conditions’ (New York 1915), and Gonzales, V., ‘Modern Foreign Exchange’ (New York 1914).

MARRION WILCOX.

10. TRANSPORTATION AND COMMUNICATION. Brazilian railways had a total length of 16,294 miles open to traffic on 1 Jan. 1916. The government owns and administers 2,929 miles; 5,716 miles were privately leased; 3,447 miles held by government concessions, granted to various enterprises; and 3,897 miles operated by private corporations under state concessions in 1914. The design of the entire system is such that, when completed, the Brazilian lines will connect with the very important railway system of Argentina and those of Paraguay and Uruguay.

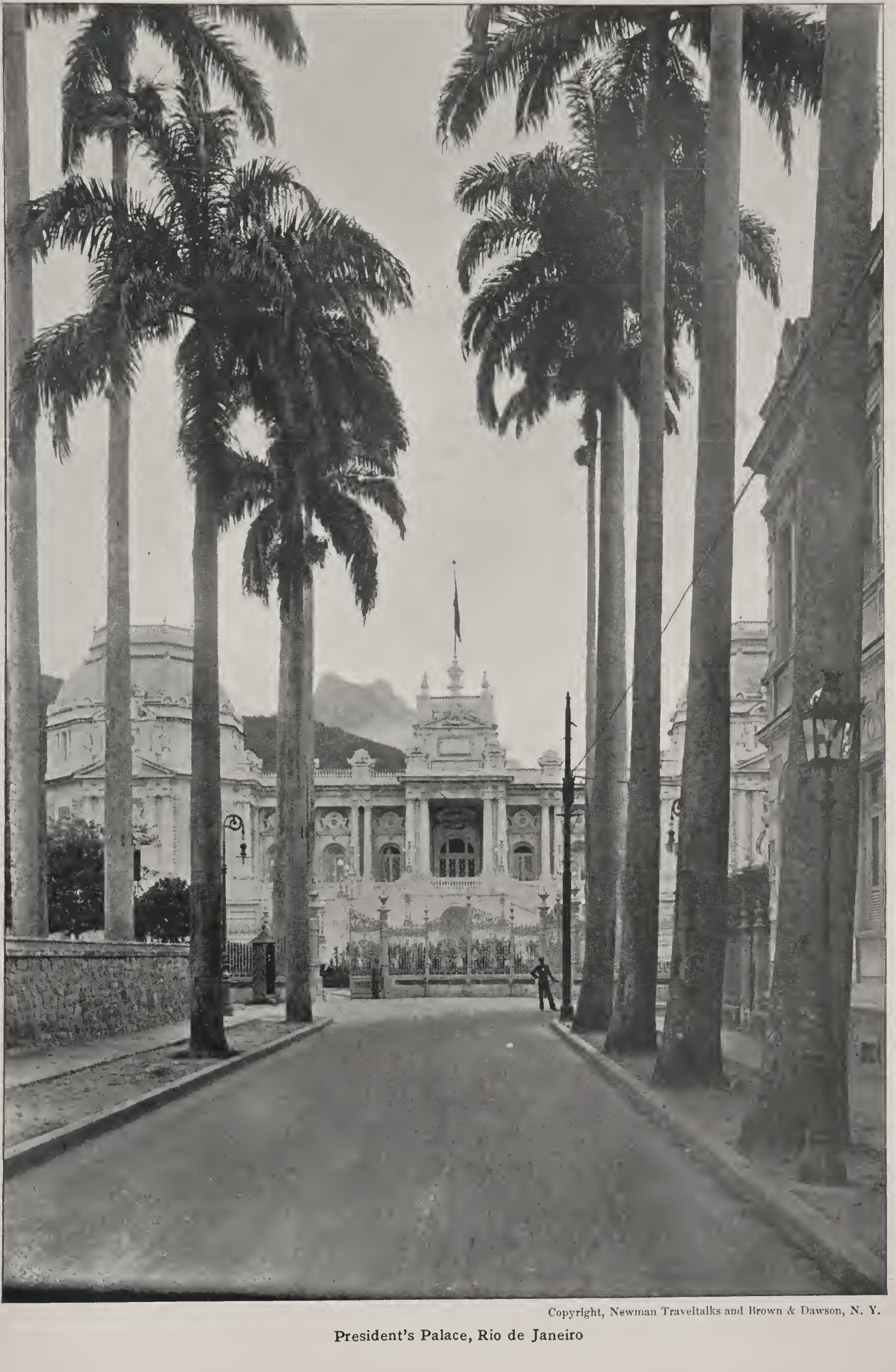
Railway construction in Brazil dates back to 1854 when a line nine miles long connecting Porto do Mauá with Ruiz do Serra was completed. But it was not until four years later that the first government road was opened for traffic. Since then the government has taken an active part in the railway construction of the republic. The railways of Brazil are almost all in the states bordering on the coast or the great rivers; and, for the size of the country and the extent of its population, they form an inadequate means of transportation. The vast interior stretches of the country suffer most in this respect, many of them having no railway communication whatever except an occasional short, privately owned line used generally for industrial purposes. There was, in 1917, through railway connection from Rio de Janeiro to Montevideo in Uruguay over the Rio Grande do Sul and the Rio de Janeiro systems. These two systems which have many branch lines, extensive though they are, cover but a small part of the southern Atlantic coast country of Brazil. Another railway system with Bahía for its headquarters supplies transportation facilities northward to Cape Saint Roque, with Pernambuco as the most important northern terminus. On the northern coast some 300 miles of railway connect the port town of Ceará with Milagres, almost due southward in the mountains. Still further north Pará is connected with Bragança on the sea coast by rail. All these systems, except the two first mentioned, are as yet unconnected with one another. And even if they were they would form but a fringe ornamenting, at intervals, the skirt of Brazil where it touches the Atlantic. Over a stretch of 2,500 miles due east and west, and for a distance of almost 2,000 due north and south through the heart of great central Brazil, not a railway exists. It is a land rich in possibilities which only transportation can help to realize; for it is capable of growing almost every known produce of tropic, sub-tropic and temperate lands.

The Brazil Railways Company was reorganized in Paris in August 1917 on a plan providing for the extension of all bond issues to the uniform date of 1969; the placing of all interests upon an income basis; a uniform system of sinking-fund payments beginning in 1922 for all series of bond issues; the discharge in full of all floating debt to secured creditors through new secured debentures subordinate to the other issues; and the raising of new capital of 80,000,000 francs by the issue of 25-year 6 per cent prior lien bonds. The first issue, 21,000,000 francs, was taken by the French banks.

The chief Atlantic ports of Brazil are: Rio de Janeiro, Santos, Pernambuco, Bahía, Puerto Alegre, Rio Grande, Ceará and Paranagua; the most important Amazonian ports being Manáos (on the Rio Negro near its confluence with the great river) and Pará. At these ports are registered many transatlantic lines — about 50 in all; and the merchant navy of Brazil which consisted in 1916 of 377 steamers of 290,637 tons and 290 sailing vessels of 60,728 tons net, all of which, together with all coasting and river vessels, must by law be Brazilian. This has been added to materially since, for the Brazilian government undertook, when German and other European shipping failed her, to fill the field with native vessels. The Brazilian Lloyd, which had long maintained a monthly service between Rio de Janeiro and New York, established a line connecting Portuguese, English and Brazilian ports. When the Brazilian government seized, in 1917, the 43 German vessels interned in Brazilian ports (a total of 221,000 tons), a part of this tonnage was added to the Lloyd Brasileiro, which thus, with the fleets of the Commercio e Navegação and the coast lines had early in 1917 over 375,000 tons under its direction. Since the beginning of 1915 the policy of the Brazilian government has been to build up, at all sacrifice, the merchant navy and to encourage, by liberal subventions, independent river and coast shipping. The efforts of the Brazilian government to replace shipping facilities lost through the war include the chartering of native and foreign vessels for a wide variety of destinations, including home, Latin-American, United States and European ports. The shipping service to Montevideo, Buenos Aires and New York was largely reorganized and a much more efficient and frequent service connected Rio de Janeiro, Santos, Montevideo, Bahía and Pernambuco, which had suffered greatly from lack of shipping facilities during the first two years of the European War.

Arrangements were also entered into with Japanese steamship lines for largely increased facilities for shipping between Brazil and Oriental ports; and encouragement was given to the Japanese lines to increase the immigration of Japanese to Brazil. Among the lines included in this agreement were the Oriental Navigation Company and the Japanese Commercial and Navigation Company.

For several years past the Brazilian government has encouraged the national shipping by subsidies and other privileges. The amounts thus paid out and the favors extended have increased from year to year. In 1917 $1,854,487 were provided in the budget for these shipping subsidies, almost 60 per cent of which went to the Lloyd Brasileiro Company which is owned by the Brazilian government. The other companies receiving subsidies from the government were: the Coast Navigation Company, the Amazon River Navigation Company, the Empreza Viação do São Francisco, the River Paranhyba Steamship Company, the Maranahão Steamship Company, Empresa Fluvial Piauhyense, Cía. Estradas do Ferro do Norte do Brazil, the Baixa San Francisco Navigation Company, the Bahíana Navigation Company and the Pernambucana Steamship Company. Some of these companies also receive subsidies from one or more of the Brazilian states. The budget law of 1917 empowers the President of the republic to «concede a premium of $12 per ton displacement from 80 up to 500 tons; of $19.20 per ton from 500 to 1,500 tons and of $24 per ton from 1,500 to 6,000 tons to all vessels constructed in the ports of Brazil.» Vessels constructed or acquired abroad and brought under the Brazilian flag, provided they are of more than 1,500 tons burden, receive a premium of $6 per ton displacement. In his report of 30 June 1916, the Brazilian Minister of Transportation and Public Works furnishes a confessedly incomplete list of 659 vessels under the Brazilian flag with a total capacity of 316,587 tons. Of this tonnage, the Lloyd Brasileiro furnished 126,000 tons with 66 steamers; the Companhia Commercio e Navegação, 55,500 tons with 20 vessels; the Companhia Nacional de Navegação Costeira, 17,500 tons with 18 steamers; and the Amazon Steam



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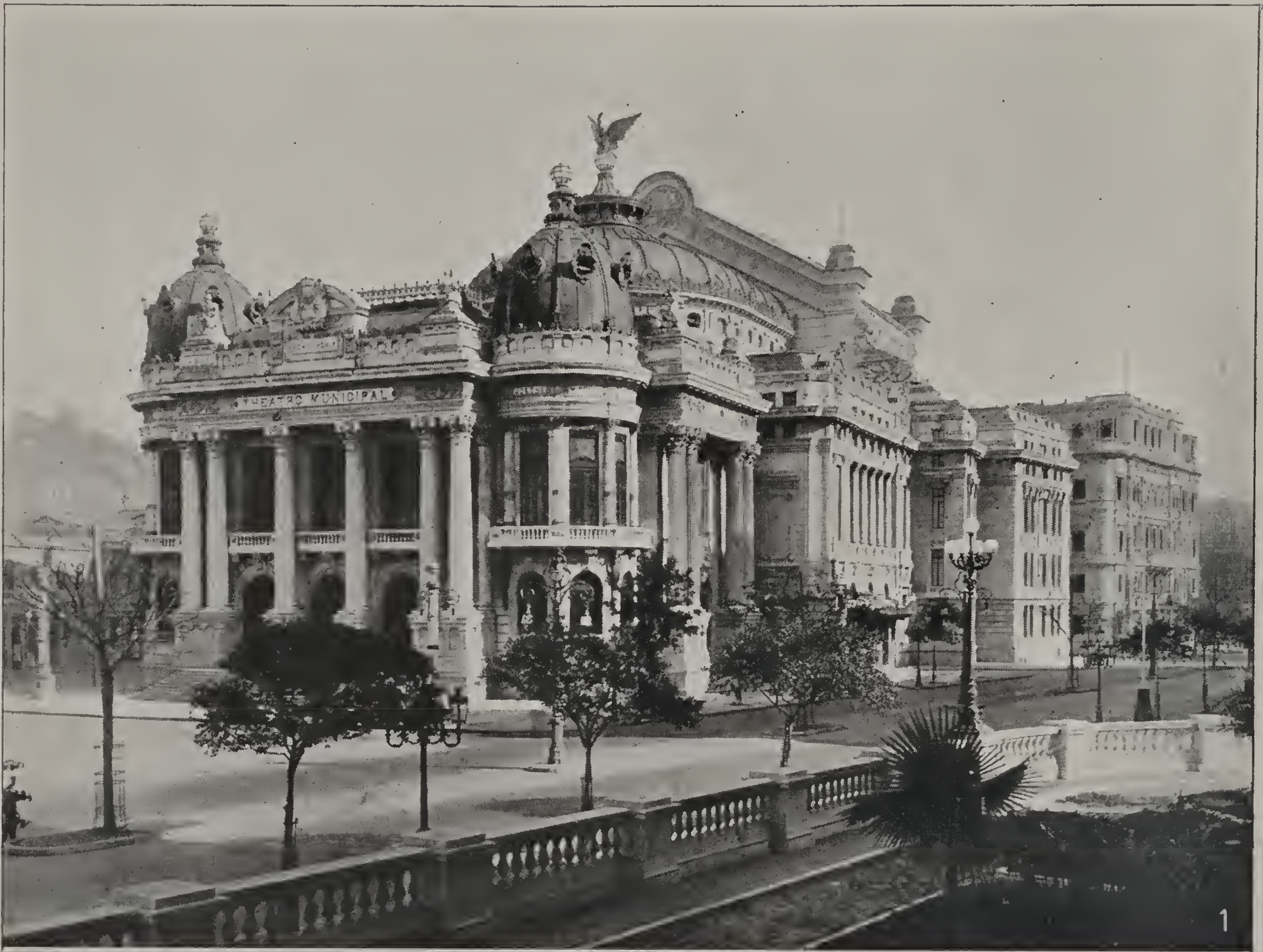

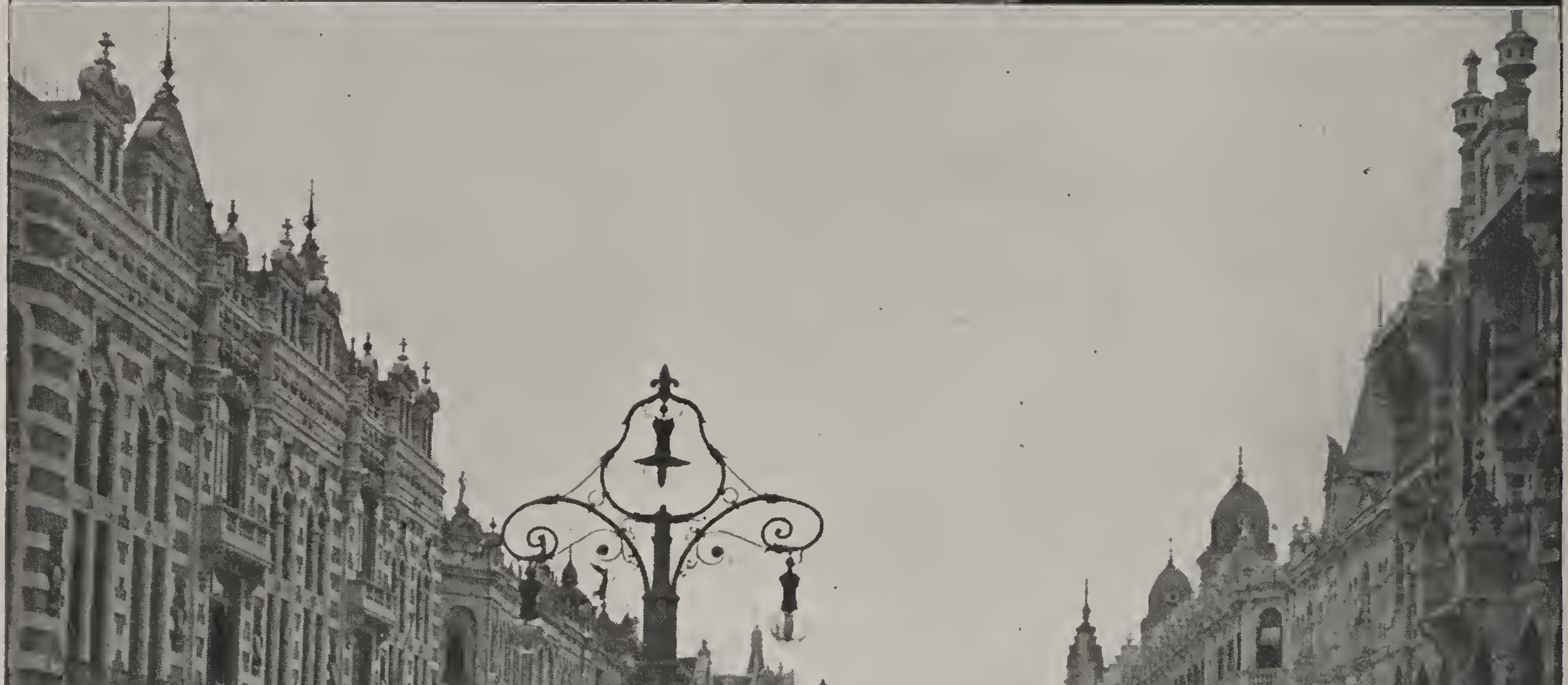

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1 The Municipal Theatre at Rio de Janeiro

2 Avenida Rio Branco, Rio de Janeiro

Navigation Company, 15,655 tons with 33 boats. Of these only the Lloyd Brasileiro and the Companhia Commercio y Navegação were regularly engaged in over-seas trade in 1917. They also carried on a coast and river business.

The attention paid by the Brazilian government to the encouragement of the merchant navy and native shipping in general has resulted in giving Brazil a much larger body of domestic shipping than is possessed by any other Latin-American nation. The significance of this will be readily recognized when it is remembered that the country as a whole is dependent upon its rivers and coastal shipping for the greater part of its transportation. In 1915 there entered the ports of Brazil 22,059 steam and sailing vessels, carrying 19,494,771 tons, while 22,504 cleared, with a tonnage of 19,471,800.

An overland mail service for letters and small packages was established by the Brazilian government in March 1917, between Rio de Janeiro and Buenos Aires, in Argentina. This mail route passes through Santa Maria, Rivera, Livramento, Uruguayana and Montevideo. In 1915 there were 3,603 post offices in the republic, and they handled during the year a total of 7,915,124 pieces of mail. Since then a considerable number of post-offices have been established, more especially in the interior of the country.

The telegraphy system, which is under the control of the government, had 725 offices in 1915, which handled 3,853,405 messages.

An extensive wireless system, in the process of completion in 1917, included 15 new stations already erected along the Amazon and the Paraguay rivers and five on the coast.

Telephone lines are generally found in the larger towns and cities, and telephone facilities are being rapidly extended in the centres of population.

By a decree of 28 March 1917, official approval was given to a plan for the linking up of the various telephone lines in the Federal district and the states of São Paulo and Rio de Janeiro, and the work of carrying the decree into effect was at once proceeded with. The two telephones concerned were the Companhia Rêde Telephonia Bragantina and the Interurban Telephone Company of Brazil.

John H. Cornyn.

11. THE ARMY AND NAVY. Army.— Military service is obligatory on all male citizens from the 21st year to the 44th, inclusive, with numerous exceptions, such as that made in favor of men who demonstrate skill in marksmanship. Instruction by French officers has produced excellent results for the military police of São Paulo. Terms of service are two years in the ranks, seven in the reserve — or, as it is called, the active reserve — seven in the territorial army and the remaining years in the national guard. The country is divided into military zones, embracing 21 districts. Reservists are called out for one month of training each year; territorialists for two weeks or more annually. Units of the active army are 15 regiments of infantry, 12 of cavalry (of four squadrons) and five of two squadrons besides the cazadores; five regiments of field artillery (nine batteries, each with four guns); nine horse artillery, five howitzer and six mountain batteries; five battalions of engineers and nine of garrison artillery. Total in the service, 94 batteries, of which 36 are in fortifications. The Brazilian artillery owes the beginning of its organization to the Conde de Eu, a brilliant officer in the time of the Emperor Dom Pedro. Of more practical and modern seeming, in the engineer's class, are the 17 sections of men skilled in telegraphy, construction of bridges, railways and aeronautics. The military zones or territorial districts supply men for five strategical and three cavalry brigades which are stationed near the frontiers of Argentina, Paraguay and Uruguay. The total peace strength of Brazil's land forces is about 25,000, to which may be added a gendarmerie of 20,000. In time of war the number may (it is sometimes asserted) be increased to 60,000 or even five times that number if equipment can be found.

Navy.— The naval contingent is composed of 7,500 to 8,000 men in all, and the squadron of the following units: The dreadnoughts *Minas Geraes* and *São Paulo* (each having displacement 19,281, principal armament 12 guns of 12 inch and 22 of 4.7 inch, H.P. 23,500 and nominal speed 21); the old battleships *Deodoro* and *Floriano* (each with displacement 3,200, principal armament two guns of 9.2 inch and four of 4.7 inch, H.P. 3,400 and nominal speed 14); protected cruisers *Bahía, Rio Grande do Sul* and *Ceará* (each having displacement 3,500, principal armament 10 guns of 4.7 inch and H.P. 18,000); the old *Barrozo* (displacement 3,450, six guns of 6 inch, four of 4.7 inch and two torpedo tubes), and *Tammandare* (displacement 4,500, 10 guns of 6 inch, two of 4.7 inch and two torpedo tubes); also five torpedo gunboats and four first-class torpedo boats, 10 Yarrow destroyers and four destroyers, a mine ship of 1,500 tons, a small vessel (1,200 tons) for hydrographic service, three submarines and other vessels, the total number being 52. The naval school is at Rio de Janeiro. Ladario, in Matto Grosso, has a river arsenal; other arsenals are at Rio and Pará.

Marrion Wilcox.

BRAZIL, Ind., city and county-seat of Clay County, 16 miles northeast of Terre Haute, on the Central Ind., the Chicago & E. Ill. and the Vandalia railroads. It is an important railroad centre and in its vicinity are rich mines of block coal. Inexhaustible deposits of clay and shales are also found here, and the city contains manufactures of pumps, tiles, machinery, clay products, tin products, wire fence, brick, sewer pipe, pianos, etc. The United States census of manufactures for 1914 reported 30 industrial establishments of factory grade, employing 677 persons, of whom 583 were wage-earners, receiving $367,000 annually in wages. The capital invested was $1,639,000, and the year's output was valued at $1,471,000; of this, $514,000 was the value added by manufacture. Brazil was settled in 1856, incorporated in 1873; is governed by a mayor, elected quadrennially, and a city council; has a Carnegie library and controls its own waterworks. Pop. 10,000.

BRAZIL-CABBAGE, or **CHOW CARAIBE** *(Caladium sagittifolium or Xanthosoma sagittifolium)*, a West Indian plant of the natural order *Araceæ,* widely cultivated in the tropics for its starchy edible tubers, which are used like potatoes, and its succulent leaves, which are cooked like spinach. The plant almost entirely lacks the acridity which characterizes other members of the order. It is extensively grown in Porto Rico under the name Yautia.

BRAZIL-NUT, CASTANEA, CREAM NUT, NIGGER-TOE, PARÁ NUT, the seeds of two species of Brazilian trees, the only ones of their genus, of the natural order *Myrtaceæ.* The better-known species, *Bertholletia excelsa,* is a tree which often attains a height of 150 feet and a diameter of four feet. It has bright green, leathery leaves, two feet long and six inches wide, and cream-colored flowers followed by very hard-shelled fruits about six inches in diameter, containing about 20 three-sided, wrinkled seeds which are largely exported from Pará and from ports of French Guiana. They are used for dessert and confectionery and for the manufacture of an expressed oil used in oil painting, lubricating and lighting. Though of stately dimensions, the tree is of little decorative use. It covers extensive tracts in northern Brazil and is especially abundant along the Amazon and Orinoco rivers. The seeds of the monkey-pot tree, known as sapucaia nuts, are considered superior to Brazil-nuts, but are not yet commercially important, owing to the distance they must be transported from the interior country.

BRAZIL TEA, a drink prepared from the leaves of *Ilex páraguensis.*

BRAZILIAN GRASS, an incorrect name popularly applied to a substance used in the manufacture of a very cheap kind of hats, known as Brazilian-grass hats and also as chip hats. It consists of strips of the leaves of a palm, *Chamærops argentea,* which are imported for this manufacture and chiefly from Cuba.

BRAZILIAN PEBBLE, a colorless and transparent variety of quartz, used for high-grade lenses.

BRAZILWOOD. A dark red or brown dye-wood exported from the West Indies, Brazil and other South American countries. Various grades appear in the market under diverse names, such as Pernambuco wood (*Cæsalpinia echinata*), Saint Martha wood and All Saints' wood, which are most valued. Except in a few cases, botanists have not definitely determined the species which furnish the different grades, but large quantities are derived from *C. brasiliensis,* a small tree, bipinnate leaves and flowers in panicles. It is indigenous in rocky ground, especially in the West Indies. The valuable part is the heart-wood, of which there is but little when compared with the thick, valueless sap-wood. This useful part is at first light colored, but when exposed to light, air, alcohol or ether readily yields up its red coloring-matter, called "brazilin." Formerly it was largely used in dyeing, but coal-tar dyes and other manufactured dyes have generally supplanted it. It is still used in red ink-making. The name is said to be derived from Braxilis, not Brazil, since sappan wood, which is believed to be identical, was used prior to the discovery of America.

BRAZING, or **BRASS-SOLDERING,** the process of uniting two pieces of brass, two pieces of copper or one of each by means of a hard solder, that is, a solder which fuses at a comparatively high temperature. The solder usually consists of alloys of copper and zinc (though sometimes tin and other metals are added) which have been melted and fused and, after cooling and hardening, are filed down to the form of a coarse powder. It is always mixed with borax to prevent the oxidation of the metals soldered together. It is usual to moisten this mixture with water before spreading it over the surfaces to be joined. When the solder has been applied in this state, the pieces of metal are slowly heated, by which the water is made to evaporate, leaving a crust of the solder on the parts where it is required. The pieces are then exposed to a stronger heat until the borax melts and fluxes the solder, which suddenly flushes the joints of the pieces of metal and thus unites the two surfaces, making them into one piece. The whole is now allowed to cool and is afterward dressed with a file. Pieces of metal united in this way are held together as firmly as if they were only one piece.

BRAZOS, brä'zōs, formerly called **BRAZOS-DE-DIOS,** a large river in Texas, formed by the junction of the Clear and Salt forks, in Young County, once known as the Staked Plain, between the parallels of 33° and 34°. It flows southeastward between the Colorado and Trinity, and after a course of about 900 miles falls into the Gulf of Mexico, between Quintana and Velasco, 40 miles west-southwest of Galveston. It is navigable by steamers during the wet season for about 300 miles and at all seasons to Columbia, 40 miles from its mouth. Among the towns on its banks the chief is Waco, about halfway from its mouth, now an important railway centre. The cotton plantations on the Brazos are highly productive.

BRAZOS DE SANTIAGO, Tex., village 30 miles east of Brownsville, on the northern bank of the Rio Grande, in Cameron County. The battles of Palo Alto and Resaca de la Palma, in 1846, were fought about half way between Brazos and Matamoras. It carries on much coasting and foreign trade, although a shifting sand-bar is a serious obstacle to its commerce.

BRAZZA, brät'sa (ancient BRACHIA), an island in the Adriatic Sea, off the coast of Dalmatia, of which it constitutes a separate administrative district 170 square miles in extent (the largest of the Dalmatian Islands), and is separated from the mainland by a channel 12 miles broad which affords excellent anchorage for shipping. The island is mountainous and well wooded, and in the valley vines are grown from which are made the best wines of Dalmatia. It produces also good oil, almonds and saffron, and grain in small quantity, and the fisheries are valuable. Much attention is paid to the cultivation of bees and silk-worms. There are important marble quarries. The chief town, Saint Pietro di Brazza, has a small port, defended by a mole. Pop. 22,697.

BRAZZA-SAVORGNAN, brät-sa-sä-vôr-nyän, **Pierre Paul François Camille,** French explorer: b. on board ship, off Rio de Janeiro, Brazil, 26 Jan. 1852; d. Dakar, French West Africa, 15 Sept. 1905. He entered the French navy in 1875, after becoming a naturalized

French citizen, and during 1876-78 explored the Ogowe and Kongo regions of Africa, discovering a practical route to the sea, and made treaties between France and the natives. In 1879 he had reached Stanley Pool (afterward Brazzaville), where Stanley met him, and was astounded at the simplicity of his equipment. He was the only European in his expedition. In 1886 he was made governor of the French Kongo and Gaboon colonies, which he had thus secured. After a sojourn in France, he returned to Africa in 1888 as commissioner-general of the whole of French Kongo. The next six years were spent in explorations and in the consolidation of French power in central Africa, after which, in 1897, he returned to France. It was while returning from an investigation into alleged scandals in the administration of the French Kongo that he died. He was singularly happy in his relations with the natives, and to him France owes her possessions in the Kongo region.

BREACH, in military siege operations, the aperture or passage made in the wall of any fortified place, by the ordnance of the besiegers, for the purpose of entering the fortress. They should be made where there is the least defense, that is, in the front or face of the bastions. In order to divide the resistance of the besieged, breaches are commonly made at once in the faces of the attacked bastions and in the ravelin. This is effected by battering and, at such places as the cannon do not reach, by the aid of mines. The breach is called practicable if it is large enough to afford some hope of success in case of an assault. This is generally considered to be the case if it allows a passage of 14 men abreast. Frequently, however, a breach of much less extent, even of half that width, may be entered. See FORTIFICATION; SIEGE.

BREACH, *in law* any violation of a legal obligation. A continuing breach is one where the condition of things constituting a breach continues during a period of time, or where the acts constituting a breach are repeated at brief intervals. In pleading, a breach is that part of the complaint in which the violation of the defendant's contract is stated. It is usual in assumpsit, where the common-law rules of pleading are still in force, to introduce the statement of the particular breach, with the allegation that the defendant, contriving and fraudulently intending craftily and subtilely to deceive and defraud the plaintiff, neglected and refused to perform, or performed the particular act, contrary to the previous stipulation. In debt, the breach or cause of action complained of must proceed only for the non-payment of money previously alleged to be payable; and such breach is very similar whether the action be in debt on simple contract, specialty, record or statute.

Breach of Contract.—The failure to perform a thing which one has contracted to perform. In all cases a failure to perform is not a breach of contract, because if he who undertakes to perform a certain thing can show that he acted in good faith and has substantially fulfilled his contract, a small deviation is not held to constitute a breach. Formal refusal, therefore, to a demand for performance is not the sole requisite to a breach, as the default of itself constitutes a breach. See CONTRACT; DAMAGES; TORT; and consult the authorities under those articles.

Breach of Promise of Marriage.—An action lies for this on the part of either man or woman, though, as a rule, only the latter is believed to be substantially injured or to deserve damages. There must be a legal and valid consideration, but as there are always mutual promises they are a sufficient consideration for each other. The minds of the parties must meet; that is, there must be a request or proposition on the one side and an assent on the other. If the communications between the parties are verbal, the only questions which usually arise relate to evidence and proof. The exact words or time or manner of the promise need not be proved, but it may be inferred from the conduct of the parties and from the circumstances which usually attend a promise to marry. (15 Mass. 1; 2 Penn. St. 89). When the parties are at a distance from each other, and the offer is made by letter, it will be presumed to continue for a reasonable time for the consideration of the party addressed, and if accepted within a reasonable time and before it is expressly revoked, the contract is then complete.

A promise of marriage is not within the third clause of the fourth section of the statute of frauds relating to agreements made upon consideration of marriage; but if not to be performed within one year it is within the fifth clause and must therefore be in writing in order to be binding. If no time be fixed and agreed upon for the performance of the contract, it is in contemplation of law a contract to marry within a reasonable period after request and either party may call upon the other to fulfil the engagement, and in case of default may bring an action for damages. If both parties lie by for an unreasonable period and do not treat the contract as continuing, it will be deemed to be abandoned by mutual consent. The defenses which may be made to an action for breach of promise of marriage are, of course, various, but it is only necessary to notice in this place such as are in some degree peculiar. Thus, if either party has been convicted of an infamous crime or has sustained a bad character generally and the other was ignorant of it at the time of the engagement; or if the woman has committed fornication and this was unknown at the time to the man who promised to marry her; or if the woman is deeply involved in debt at the time of the engagement and the fact is kept secret from her intended husband; or if false representations are made by the woman, or by her friends in collusion with her, as to her circumstances and situation in life and the amount of her fortune and marriage portion,— any of these facts, if properly pleaded, will constitute a good defense. If after the engagement either party is guilty of gross misconduct, inconsistent with the character which he or she was fairly presumed to possess, the other party will be released. If the woman insists upon having her property settled to her own personal use, it is said that this will justify the man in breaking off the engagement. So, if the situation and position of either of the parties as regards his or her fitness for the marriage relation is materially and permanently altered for the worse (whether with or without the fault of such party) after the engagement, this will release the other party.

Breach of Warranty.— In sales of personal property an express warranty is one by which the warrantor covenants or undertakes to insure that the thing which is the subject of the contract is, or is not, as there mentioned; as that a horse is sound, that he is not five years old, etc.

An implied warranty is one which, not being expressly made, the law implies by the fact of the sale. For example, the seller is understood to warrant the title of goods he sells when they are in his possession at the time of the sale. (1 Ld. Raym. 593). In general there is no implied warranty of the quality of the goods sold. The rule of the civil law was that a fair price implied a warranty of quality. This rule has been adopted in Louisiana and South Carolina. There may be an implied warranty as to character, and even as to quality, from statements of the seller or a purchase for a specified purpose. Any substantial failure, in the article supplied to the buyer in pursuance of the contract of sale, to come up to the quality warranted, amounts to a breach of the warranty, and proof of it establishes the buyer's right to an action therefor. This rule applies to all cases where the remedy sought is by an action on the warranty for damages or by way of set-off in a suit for the purchase-money; in such cases the buyer is bound to prove the breach and the damages suffered by him in consequence of it and can recover only to the extent of the damage so proved. A warranty of soundness does not extend to a visible defect. A vendor of personal property is not liable for latent defects, known to him but unknown to the purchaser, unless he has used some artifice to deceive the purchaser in regard to such defects or has warranted the article. Where an article is warranted as fit for a certain purpose, the seller is liable for an injury sustained by the vendee in consequence of its unfitness. Under an executory contract to sell goods *in transitu*, the vendor is obliged to tender a merchantable article. On a sale of an article known to be intended for food there is an implied warranty that it is sound, wholesome and fit to be used as an article of food. (15 Hun 504). The authority of an agent to warrant goods sold will be implied where it is usual in the market to give a warranty on the sale of such goods; such authority, however, will be implied only as to goods sold at the time of the warranty, which will not extend to subsequent sales in the absence of express warranty.

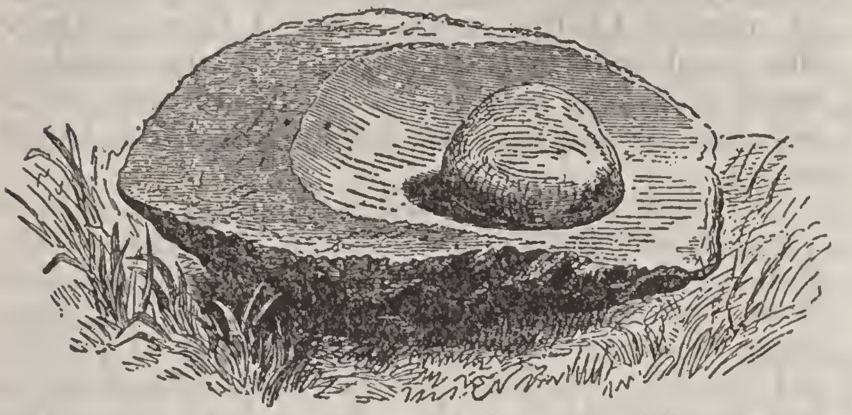
Breach of Duty.— The non-performance of a duty, or the performance of it in such a manner that injury is done to one's employer, through want of integrity or due diligence and skill. It is assumed that there is an implied contract between an employer and the person that he employs, according to which the latter agrees to perform the duties entrusted to him in such a manner that the interests of his employer shall not suffer. In case of breach of duty, what is called an action in assumpsit — that is, an action for the recovery of damages for the non-performance of a promise, which, though not under seal, is yet founded on proper consideration — may be brought by the one who has sustained an injury against the persons by whom the breach has been committed.

Breach of Peace.— The taking part in any riot, affray or tumult which is destructive to the public tranquillity, or the causing others to do anything to injure the public tranquillity. The former are actual, the latter constructive breaches. In both cases the breach of the peace may be either felonious or not felonious. The felonious breaches of the peace are three in number: (1) The riotous assembling of 12 or more persons and not dispersing upon proclamation; (2) the riotous demolishing of churches, houses, buildings or machinery; (3) maliciously sending, delivering or uttering, or directly or indirectly causing to be received, knowing the contents thereof, any letter or writing threatening to kill or murder any person. The remaining offenses are not felonious and include: (1) Affrays; (2) riots, routs and unlawful assemblies, which must have at least three persons to constitute them; (3) tumultuously petitioning; (4) forcible entry or detainer, which is committed by violently taking or keeping possession of lands or tenements with menaces, force and arms and without the authority of the law; (5) riding or going armed with dangerous or unusual weapons, terrifying the good people of the land; (6) spreading false news; (7) false and pretended prophecies, with intent to disturb the peace. Finally, there are two constructive breaches of the peace, namely, challenging another to fight, or bearing such a challenge, and the making public by either printing, writing, signs or pictures, malicious defamations of any person, especially a magistrate, in order to provoke him to wrath or expose him to public hatred, contempt and ridicule.

Breach of Trust.—A violation of duty by a trustee, executor or any other person in a fiduciary position. A trustee is not permitted to manage an estate entrusted to him in such a manner as to derive any advantage to himself, and at the same time he is bound to manage it in such a manner that the person for whom he has it in trust shall reap from it the greatest possible advantage. Accordingly money held in trust by a trustee must be invested by him in government stock, or in certain other special securities, for the behoof of him for whom he has the money in trust; and if he has not done so he is, as a general rule, liable for interest on the trust funds. Formerly it was the duty of the trustee to invest money in government securities alone, but under certain acts (unless the trust deed expressly forbids) a number of other sound investments are allowed. A trustee who has grossly mismanaged his trust may have to repay money lost, with interest, and sometimes compound interest. (See TRUSTEE). The Court of Chancery has adopted two rules to guide the decisions with respect to the liability consequent upon a breach of trust. The purport of the first is, that, with a view not to strike terror into persons acting for the benefit of others, the court will deal leniently with trustees who have endeavored fairly to discharge their duty, and in case of any misapplication of the trust money the court will not hold the trustees liable on slight grounds. The second rule is, that care must be had to guard against any abuse of their trust on the part of the trustees. A fraudulent misuse of trust funds is punishable as a misdemeanor with fine and imprisonment.

BREAD AND BREAD MAKING.

Historical.— Baking is probably the very oldest industry man engaged in. Wheat and barley, the oldest cereals known to have been cultivated, have been found together with the ploughshare fashioned of wood and the stone hand-mill consisting of a hollowed stone and a stone ball-shaped crusher among the remains left by prehistoric man deposited in his burial places or found embedded in the earth over or near which he had his dwelling places. These implements, together with arrow heads, spear heads and battle axes, all of flint or stone (Stone Age of man) gave evidence that man at that time was unacquainted with the use of metal, and that his primitive culture must have dated back some five to ten thousand years before the beginning of the Christian era.



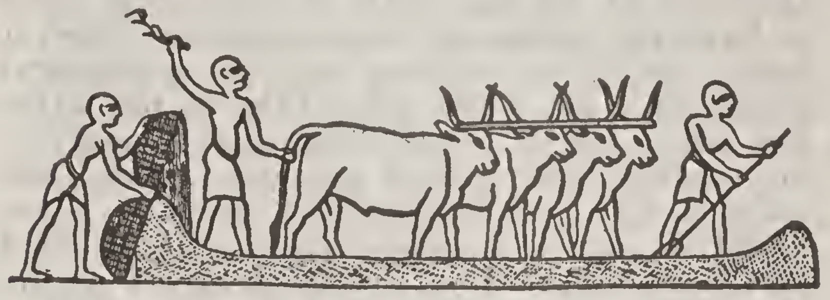
Hand-mill of the Lake Dwellers (5,000 years ago)
(From Livingstone " Missionary Travels.")

Food of Primitive Man.— While the finding of the remains of wheat and barley and the ploughshare gave evidence of agricultural pursuit; the bones of domestic animals and wild animals and the remains of clams and oysters indicated that his diet was quite a variegated one; that he employed the domestic animals to ease his own work, while remnants of woven fabrics, especially from flax fibre, indicated that he had learned to cultivate plants for other than food purposes.

Ancient mode of ploughing in Egypt (Rawlinson)

Oldest Form of Baking.— The oldest bread was made in the form of cakes or fritters, simply prepared by mixing wheat or barley meal to a batter with water and milk, and baking these batter cakes, of, may be, the size and form of our present day griddle cakes, on hot ashes or over redhot coals, or a hot stone which represented the first bread pan and oven combined. Salt was probably the only other ingredient besides the meal and water and milk, as there certainly was no baking powder and yeast was not used until brewing beer from germinated barley had become known, though sour dough bread was probably as well known as sour milk products.

The Egyptians, as the remains found in the tombs of the pyramids show, had perfected both baking and brewing 1,500 years before the beginning of the Christian era, and the Old Testament makes mention of a mill known to the Assyrians. These occupations had become organized industries. In Egypt, in brewing as well as in baking bread, the grain was crushed, mixed with water to a dough and fermented by the addition of fermenting bread mash, which was then baked. The fermented beverage was simply prepared from slightly sprouted barley or other grain, by crushing it, mixing with water to a mash, slightly baking the dough, breaking the bread, making a mash with water and adding fermented mash once more for fermentation. The fermenting beverage then supplies the yeast for baking.



Oxen treading out wheat (Rawlinson)

From Handicraft to Industry.— How baking developed from a simple handicraft, with a stone hand-mill furnishing the grist or meal, and the baking of a batter of meal and water on ashes, or over redhot coals, or on a hot flat stone, into a highly developed art, through the ages, and then into one of the most important industries engaged in by man, would indeed form an interesting story for this article, would space permit. Man learned to use bronze metal to fashion his tools, utensils, weapons, long before he had found iron. The bronze age of man, which lasted probably upward of a thousand years, preceded that of the iron age. In this period iron took the place of bronze and stone. Unlike the use of bronze which had spread westward and northward from Asia and Africa iron was first discovered and made use of by the Celts in northwestern Europs, from where it spread eastward and southward.

Winnowing (Rawlinson)

Primitive Baking Pans.— Flat sheets of iron, rounded and provided with a wooden handle, early in the culture of our European ancestry took the place of the hot stone, hot ashes or coals in baking flat cakes, and this led naturally to the development of the bread pan and the employment of these singly or in larger number to the development of the bakers' oven, which in the time of the Egyptians was fashioned out of clay with a flat bottom and arched roof, of varying size for household and shop use.

Modern Bakery Shops, Products, Materials.— Modern bakery shops in America, equipped with costly and intricate machinery, have attained to the dignity of factories with a daily consumption of flour ranging from 20 to 200 barrels, and a daily output of over 5,000 to 50,000 loaves of bread. Bread, rolls, biscuits and cakes are all produced on a large scale and of such quality and price that it is no longer an object of the housewife in our larger cities to have the baking of these products done at home, excepting perhaps out of sentimental promptings, say the wedding cake or the birthday cake. Wheat bread is the chief product of the modern bakery, then rye bread, then soda biscuits, rolls, cake and sweet biscuits. Over 50,000,000 barrels of wheat flour are consumed in the manufacture of wheat products in the United States annually, of which about 35,000,000 go into wheat bread; 5,000,000 into soda biscuits; 2,500,000 into rolls, 2,500,000 into cakes and sweet biscuits. The amount of rye flour for rye bread and other uses is approximately 10,000,000 barrels. Into the making of various products the following materials enter:

Wheat bread.— For one barrel of wheat flour, 196 pounds, about 110 pounds of water; 2 to 4 pounds of shortening (lard, fat or vegetable oil); 2½ to 4 pounds of salt; about 5 to 6 pounds of cane sugar; 1½ pounds of malt extract; 2½ pounds of pressed yeast, small quantities of milk.

Whole rye bread (pumpernickel).— For one barrel of whole rye flour of 196 pounds, about 90 pounds of water; 2½ to 4 pounds suet; about 2 pounds cane sugar; 1 pound compressed yeast. The dough is aërated by employing sour dough for leavening, the leaven being daily mixed with more dough, the mass ripening again in 24 hours or over night to more leaven; the process being kept up indeterminately often without adding yeast, as this develops in the sour dough.

Mixed rye bread.— Generally rye flour is mixed with from 25 to 50 per cent of wheat flour, in order to improve color and aëration. Naturally the characteristic quality of rye bread is lost with a larger percentage of admixture.

Rolls.— The same material as for wheat bread is used, with larger quantities of milk.

Soda biscuits.— Wheat flour, 1 barrel; water, 100 pounds; salt, 2 pounds; yeast, ½ pound; bicarbonate of soda in sufficient quantity to neutralize acidity formed in the dough. The brittle nature of the soda biscuit as compared with bread is due entirely to the process of manufacture.

Cake.— Wheat flour 10 pounds and milk or milk and water 5 pounds or in the proportion like wheat bread; butter or lard, 2 pounds per 10 pounds of flour; eggs, 2 pounds; a little salt; sugar, 2–3 pounds; baking powder, 2 ounces or less.

Merits of Various Cereal Flours and Other Materials Scientifically Considered.— Wheat and rye and barley have been, for ages, the cereals from which European peoples have baked their bread. Whether wheat is the oldest cereal used is not known; they have been discovered together in the most ancient burial places of man so that barley at one time seemed equally as important as wheat, but it was gradually superseded by the latter. It is still employed when wheat is scarce or expensive, as at present (1918) in the United States, where the food administration requires the employment of *wheat substitutes* to the amount of 25 per cent or more in the baking of wheat bread or

Victory bread in the production of which various substitute flours enter, such as barley flour, rye flour, corn flour, rice flour, potato flour, the relative value of which now becomes more clearly evident through the test of practical results. *Barley flour* has been found to be less serviceable than the other substitutes. The American barley differs greatly from the European barley in character, as has recently been pointed out by the Wahl Institute of Food Research, Chicago. American barley flour produces darker bread; a smaller loaf that is apt to be soggy, that is, insufficiently aërated. *Oat meal and flour* and resultant *bread* have much of the characteristics of barley flour and bread. *Corn meal and corn flour, rice meal and rice flour* in quantities of 25 per cent, if properly processed, will give a white bread of equal quality as whole wheat, and the employment of these substitutes probably will become a permanent feature in the American baking industry. *Potato flour* may be blended with good results with corn meal to the extent of 10 to 20 per cent of the latter.

Some Scientific Principles Underlying Baking.— The peculiar elasticity of wheat and rye flour doughs, which render them capable of retaining, better than dough from other sources, the gas generated by dough fermentation, so that the gas is held uniformly distributed in dough and bread, is due to the peculiar nature of the proteins of wheat and rye. In wheat flour these are termed gliadin and glutenin, which somewhat partake of the nature of the white of an egg. These bodies are gradually broken down through the processess accompanying yeast fermentation, resulting gradually in the proper ripening of the dough, which takes from five to six hours, and without which the finished product would be too tough — more or less rubberlike.

Rye flour contains similar bodies to an almost equal degree, and these are broken down so that the dough becomes ripened properly by employing the sour-dough principle. The acidity developed in the sour dough aids materially the yeast fermentation processes in bringing the dough to the proper stage of ripening. In American barley flour the proteins (hordeins) are quite dissimilar in nature. The ripening process does not develop in the same way as with European barley, which is of the two-rowed mellow type, whereas the American is of the six-rowed, hard, flinty type. Neither corn flour nor rice flour contain proteins of the nature of those of wheat or rye, although the gluten either contains to a considerable extent has a somewhat similar chemical composition. The bread from corn flour or rice flour alone shows no elasticity. It is too short, while corn or rice flour, as well as potato flour, may be properly used to reduce an all too great elasticity of wheat bread. Water — soft, pure, cool water, such as that which our Great Lakes supply, is best suited for baking. Hard water, such as well water, generally containing carbonate of lime and magnesia, are less suited. These waters neutralize the souring principle, produced in yeast- or sour dough-fermentation, and therefore act detrimental. Animal or vegetable fats give bread and other baking products a distinctive flavor, and aid in shortening wheat bread. Salt, that is, table salt, is necessary for seasoning bread, rolls and biscuits, for the same reason that it is required as an addition in the preparation of most of our foods. Slightly too large quantities of salt interfere with proper dough aëration.

The sour-dough principle is the ancient method of aërating the dough and bread, still used to this day in the making of rye bread The sour dough may be obtained in the first place by letting dough prepared in the usual way with an addition of yeast get over-ripe or sour; then using this sour dough in place of yeast, retaining a small part of the sour dough to mix with unyeasted dough in the proportion desired to obtain new leaven or sour dough within the desired period. Two fermentations proceed in the development of sour dough; yeast fermentation producing mainly carbonic acid gas and some lactic acid gas; and lactic fermentation producing lactic acid, but very little carbonic acid gas. It is the lactic acid that ripens the dough, the gas that aërates it.

The yeast generally employed in the form of pressed yeast cakes or bricks or mixed with corn meal and dried is composed of minute vegetable organisms, consisting of single cells, which are plainly visible as such under the microscope, but are invisible to the unaided eye. A speck of yeast just about visible contains as much as a hundred individual yeast organisms. The yeast, being a living organism, rerequires food for its sustenance, growth and reproduction. In utilizing this food it produces out of the sugar in the dough the gas which aërates the bread, an dthis fermentation is the aërating principle. Bakers' yeast is now specially prepared by yeast factories, where it is gained by the fermentation of malt and corn mashes under the influence of intense aëration. The yeast is allowed to settle, is then centrifuged and pressed and employed in the bakery within a few days. Dried yeast will keep serviceable for a long time.

Sugar and malt extract are added to the dough, not so much for sweetening purposes as for the necessity of these bodies for yeast fermentation. The sugar is decomposed in dough fermentation by the yeast into alcohol and carbonic acid gas; the latter is held in place by the tenacity of the above mentioned protein particles, which permits of thorough and uniform aëration; the malt extract contains substances besides sugar which, like the amino-bodies and phosphates, are utilized by the yeast as foods, which causes a more vigorous fermentation. Saccharose (cane or beet sugar), maltose, glucose, solid or in syrup form, are employed.

In the use of baking powders the aëration is accomplished on quite a different principle. Baking powders are composed of a weak acid, generally tartaric acid or cream of tartar, and bicarbonate of soda. Through the interaction of these two ingredients, in the presence of water, the carbonic acid contained in the bicarbonate of soda is liberated, and the aëration ensues. Baking powders are usually employed in the preparation of quick-rising products, like homemade cakes or biscuits, griddle cakes, etc.

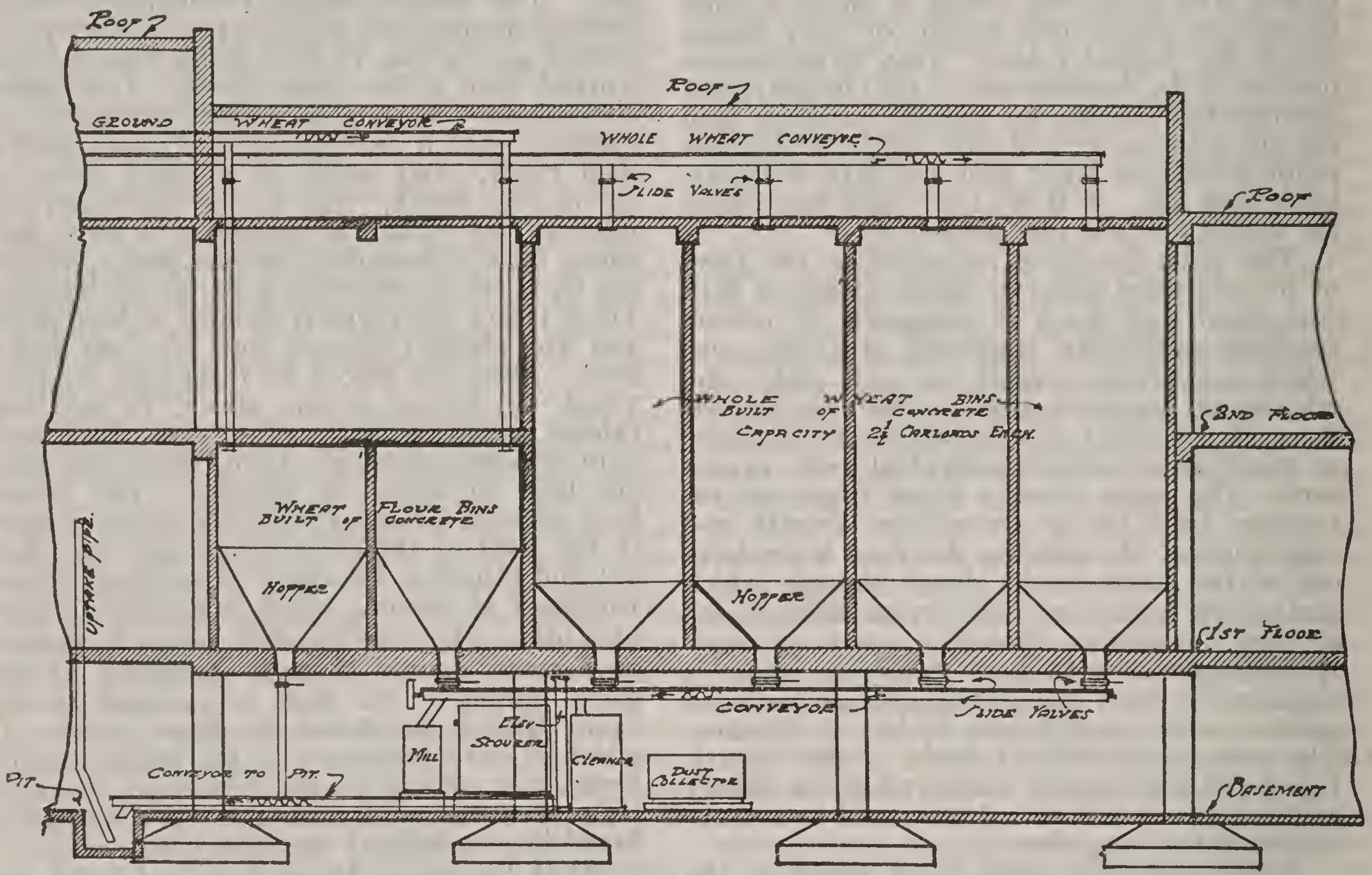
Baking Process, Wheat Bread.—*Mixing.*— In making wheat bread on a large scale the various ingredients, flour, water, salt, sugar and malt extract, lard or oil and yeast, are mixed in a mixing machine, the yeast being previously dissolved by stirring or whipping it in water. After mixing thoroughly to a homogeneous mass, the dough is placed in a trough, constructed of wood or sheet iron, the dimensions of the trough varying from 2 to 3 feet in width; depth about the same; length from 5 to 10 feet, in which dough fermentation gradually sets in and progresses for about 2 to 2½ hours to the extent of causing the dough to rise in the trough to treble and more its original volume. Now the dough is punched in the trough or kneaded and worked until it has fallen back to nearly its original volume; it is again left to rise. The second dough fermentation being finished in about 1½ hours, when it receives its second punch, that is, it is again kneaded and worked until it has fallen down. It is again allowed to ferment, this time for about 45 minutes, when it receives its third punch, and is then ready, after about 10 minutes more, to go to the bench, that is, in hand-operated bakeries, the dough is placed on a large flat, oaken table, is kneaded, cut into pieces, weighing 10, 12, 16, 21 ounces, or other denominations. These pieces are properly molded in loaf shape and are placed, flattened out, into the bread pans. These are placed on racks that are conveyed on rollers to the steam, or proofing cabinet, usually constructed of sheet iron, filled with an atmosphere of steam, where the pans are left for about 50 minutes. The dough here achieves its last rise, filling the pans quite to the level of the rim. Then they are taken out and placed in the oven, where they remain for about 35 minutes, which is usually the time of a bake. Here the bread increases its volume once more, mainly through expansion of the gases caused by the high temperature of the oven. This is the *spring,* the proper volume of which is very important to the quality of the bread, and should be one-fourth of the contents of the pan, increasing the volume of the bread by one-fifth of the whole loaf.

Soda Biscuits.— Wheat flour and water, salt and yeast, are mixed as in the manufacture of wheat bread. The dough is allowed to ferment for about 20 hours, in order to break down the gluten of the wheat entirely. During this prolonged fermentation, lactic acid acidity develops, this being the agency to break down the gluten. Now a sufficient amount of bicarbonate of soda is added to neutralize the acidity; at the same time carbonic acid gas is developed through the interaction of lactic acid and the bicarbonate of soda, both neutralizing one another, so that no acid taste nor soda taste is noticeable. In order to invigorate the fermentation, a small amount of malt extract is employed in mixing the dough.

For sweet soda biscuits and graham biscuits, an adequate amount of sugar is used in mixing. The finished dough is rolled out in flat sheets of the desired thickness. These are cut, or divided, the dough pieces placed in pans and baked.

Temperatures.— The temperature of a freshly mixed dough should be about 79 to 80°.

During dough fermentation in its three stages, the temperature gradually rises to about 85° but should not exceed this. During the proofing stage, the temperature rises to about 90°. In the oven the temperature is maintained 400 to 500° F. but the temperature in the interior of the loaf does not reach a higher degree than about 110–112. (A new bake may be made in the same oven in case of emergency each hour, but generally the oven is recharged every second hour). After taking the bread from the oven it is placed on the cooling racks, where the loaves rest in compartments provided with screen bottoms, on which the loaves are placed to allow of cooling and to prevent sweating, that is, condensation of the vapor expelled from the hot loaf in striking cold solid surfaces. While cooling, or when cooled, the bread in most modern shops is wrapped in paraffin paper for the double purpose of avoiding direct touch of the hands, and of keeping the bread fresh, as the impervious paper prevents the moisture of the bread from escaping.



Flour milling and storage at bakery of The Berhalter Health Foods Co., Chicago, Ill. Richard Griesser, Architect.

All rye bread, excepting as pumpernickel, which is whole rye flour bread, is now made with bolted rye flour from which the bran and germ have been largely removed, is mixed with 25–35 per cent of wheat flour, water, salt, leaven, sugar, lard or other shortening; the dough is left to ferment in the trough; it is punched and the manufacture proceeds as with wheat bread. A mixed rye bread, that is, bread from rye flour with an admixture of from 35 to 50 per cent of wheat flour, is prepared with yeast like wheat bread.

Bakery Construction and Equipment.— Space does not permit to go into the details of the various types of machines and apparatus, ovens, proofers, troughs and other accessories of a modern bakery. Changes in construction and equipment have become necessary from time to time as baking technology progresses; as changed values are given to materials and processes; as new methods or processes are introduced, or new requirements are made on the baker to meet government or food administration regulations.

The structure is usually of brick — two stories and a basement, with large windows, so that the process of bread making can be seen from the outside. Spacious offices, shipping rooms, retail sales room, wrapping rooms — the bread is never touched by hands except those of the white-gloved packers where automatic wrapping machines are not yet used,— separate sanitary lavatories for all departments, mixer rooms, dough cutting, weighing and molding machinery rooms, proofing and oven rooms, boiler and oven-firing rooms, are all well ventilated and lighted so that there is no dark corner in the entire plant. All interior walls are kept white with enamel or granite paint, also the white framework of all machinery used, including the proofing cabinets, while the brick or metal face of the ovens is white glazed or glass enameled. Everything is done with a view to add attractiveness to the place, so as to educate the visitor to give preference to the modern bakery output, as everything suggests sanitation and wholesomeness.

The mixing room is generally on the second floor, adjoining the flour warehouse, in which a considerable quantity of flour is always kept on hand to ensure proper ageing, since new flour will not give as good a loaf. The flour hopper or mixer feeder, with a capacity of five barrels of flour or more which is to feed the mixer, is portable, and may be conveyed to the various bin cone sifters from which the supply is taken. The hopper is run to one of the mixers, emptying its contents into it, and returning to the same or another bin for another charge of flour. Into the mixer are carefully weighed the flour; the water; the shortening (lard or vegetable oil); salt; yeast, dissolved in water; sugar, usually in the form of cane sugar; malt extract. Metal dough troughs on wheels receive the mixed dough which is given time to ferment (usually 5 to 5½ hours), the dough being kneaded or punched in the trough three times (see above). Then the troughs are wheeled to a chute in the floor and let down to the dividing machine, which is so arranged that it can cut any loaf from about 10 to 40 ounces. The dough is carried to the rounder automatically, and from thence to the proofer, where it rests for about 10 minutes in a temperature of about 80°. The pieces of dough are now let down by a conveyor to the molding machine where they are molded into the form of loaves which are placed in the bread pans. These are loaded upon conveyor racks and wheeled into the proof cabinets, where they remain from 20 to 40 minutes, according to the individual notion of the baker, in an atmosphere of steam, at about 90°. The conveying racks are rolled from the proofer to the oven, which, according to capacity, receive a charge of 100 to 500 loaves of bread, the average baking period being 35 minutes, after which the loaves are taken out by a long, wooden pole, formed at the end like an oar blade, on which the pans are caught, an implement called a peel, or the pans are passed automatically to the front in those types of ovens called rotary ovens. The loaves are again loaded on the wheeled racks, are dumped on tables and after cooling are packed into cartons or paraffin paper and reach the delivery truck-wagon to be shipped to the different stores.

Whole Wheat Meal Baking Plants.— Quite a number of modern baking plants manufacture bread and other bakery goods from whole wheat meal, which has become more extensively employed since the introduction of wheat substitutes by food administration ruling, as the wheat bread prepared from substitutes generally lacks the quality of whiteness anyway. Whole wheat bread, containing as it does the bran and the germ finely ground, or more coarsely in some meal, is darker in color — yellowish gray to yellowish brown. These products are made, *aërated* and also *not aërated.* In some whole wheat bakeries a milling plant is installed. The whole wheat is run into storage bins from the car; from these it reaches a blower and sifter that takes out the chaff and larger-than-wheat particles, like corn and other coarse impurities; then it passes over a set of screens which take out the smaller-than-wheat particles, like rye and other small seeds, leaving the wheat clean and pure to go into the roller mills, where it is crushed between a set of two corrugated rolls traveling in opposite directions, the fineness of the meal depending upon whether the rolls are set closer together or farther apart. The fine meal is employed in the production of whole wheat *aërated* bread, whole wheat cakes, pies; whereas the coarse meal is employed for *non-aërated* bread. Whole rye bread generally goes with whole wheat bread.

Whole Grain, Contra Refined Flour Products.— A movement has set in that seems constantly growing to retain in the flour as much of the valuable nutrient ingredients of the whole grain kernel as possible, be this wheat, rye, corn, barley or other cereals; that is, to use a less refined flour, or as some have it, a less denatured flour or meal, a product that contains the valuable ingredients and qualities inherent in the germ and in the bran, which is rich in nutrients, including oil, and which is replete with valuable gluten and phosphates, while in patent flour or highly refined flour these nutrients are removed through milling and bolting as much as possible, simply to obtain whiteness and better color. Thus we now have whole wheat flour, resulting from the milling of wheat without the removal of more than say 1 to 1½ per cent of the wheat in the form of bran or germ, besides graham flour, which is the unbolted wheat meal made from clean, sound wheat with only the coarse bran particle removed, by screening. Bolted wheat flour, so called, is produced by grinding of wheat with not more than 10 per cent of the weight removed in the form of bran or germ, whereas with patent flour about 30 per cent of bran and germ particles are removed by bolting.

The United States Department of Agriculture has suggested, but has not yet adopted, certain standards of flour, in part as follows: Straight flour, made from hard spring, soft spring, hard winter, Durum or soft winter wheat. This is the fine, clean, ground, unbleached product made from wheat meal by bolting or other process accomplishing the same result from which none of the purified middlings flour shall have been removed, and which does not exceed 97 per cent of the total flour produced, and contains not less than a specified percentage of nitrogene 1.50 to 1.75 per cent; of fibre not more than .50 per cent; ash, .44 to .65 per cent calculated to a moisture content of 11 per cent and differing for the different varieties of wheat. Patent flour is made from wheat as qualified for straight flour from the meal by bolting, and produced by the reduction of the best purified middlings, with a specified percentage of ash of .42 to .55 per cent. First clear flour is a straight flour made from such wheat from which the patent flour or a portion of the purified middlings has been removed with a specified percentage of ash of .70 to 1.0 per cent. Thus, patent flours are chiefly made from the inner portions of the berry farthest removed from the outer bran layer and the germ, and containing least of the component parts of either, both bran and germ being grayish in color. The flour most devoid of particles of these is naturally the whitest. They are also lowest in gluten and ash, two valuable nutrients of flour. The straight flours contain more particles of bran and germ, and consequently the flour is darker, but richer in gluten and ash, and the bakery products from these straight flours are more nutritious. The clear flours contain still more particles of bran and germ, and are still darker in color and contain more gluten and ash. Graham flours already mentioned have only the coarsest parts of the bran and in whole wheat meal or flour only the impurities (chaff, foreign seeds, dust) are removed, that is, the whole wheat, after cleaning and scouring, is ground to meal of different degrees of fineness.

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BREAD-FRUIT, a genus, *Artocarpus*, of trees of the family *Moraceæ*, consisting of 40 species, natives of the East Indies but now widely cultivated in tropical regions. The plants are large or small trees, with milky juice, their leaves large and handsome, entire or deeply lobed; the fruit is a large fleshy mass, with a rough surface, 4 to 18 inches or more in diameter and sometimes weighing 30 to 40 pounds. The common bread-fruit (*A. incisa*) is well known for its edible fruits which are a staple article of food in the islands of the south Pacific, being roasted before eating. The jack-fruit (*A. integrifolia*) is a closely related species with larger fruits which, also, are used for food.

BREAD-MAKING. See BREAD.

BREAD-NUT (*Brosimum alicastrum*), a tree of the natural order *Urticaceæ*, a native of the West Indies and closely related to the bread-fruit. The tree, which is very large, bears shining lance-shaped leaves; globose catkins of male and female flowers on different trees; and yields a gummy, milky juice from its bark. The round, yellow fruits (drupes), which are about three inches in circumference, contain each a single seed. When roasted or boiled they are used like bread, and, having a flavor which resembles hazel nuts, form a pleasant food. In the United States the tree has not been cultivated.

BREAD-ROOT (*Psoralea esculenta*), a leguminous plant with edible, farinaceous tubers. It is the *pomme blanche* or *pomme de terre* of the French pioneers. It is common on the higher prairies from Texas to Iowa and Wisconsin.

BREADALBANE, Scotland, a district in Perthshire, in the centre of the Grampians, stretching from Lochaber and Atholl on the north to Strathearn and Menteith on the south. This district is a complete mixture of high and low hills, yielding pasture for large flocks of sheep and shelter for game, with intermediate valleys, some of which are susceptible of cultivation, while others are merely areas of peat and heath. Loch Tay lies in the centre of the district. Kenmore and Killin are the largest villages. The district gives the title of Marquis to a branch of the Clan Campbell.

BREADTH, a term in art, used to denote means or effects whereby an artist becomes distinguished for largeness and mastery of treatment. Breadth of style in art is shown in work which gives the impression of these qualities, manifested in simplicity, comprehensiveness and due subordination of detail. In a work of art possessing the true characteristics of breadth, the eye, passing from one feature to another, takes in, as it were, the whole subject and meaning at a single glance.

BREAK-CIRCUIT CHRONOMETER, the name applied to a box-chronometer to which a device has been attached for breaking an electric circuit at stated intervals, usually once in two seconds.

BREAKER. See COAL MINING.

BREAKESPERE, brāk'spēr. See ADRIAN IV.

BREAKING BULK, the act of breaking open of a bundle, parcel, etc., and taking the contents so as to constitute in law a conversion or the like.

BREAKWATER. See HARBORS.

BRÉAL, brā'al, **Michel Jules Alfred**, French philologist: b. Landau (Bavaria) 1832. His parents were French and he studied at Weissenburg, Metz, Paris at Lycée Louis le Grand, and in Berlin under Bopp. In 1862 he won the prize of the Academy of Inscriptions with his 'Etude des origines de la religion Zoroastrienne.' He became professor of comparative grammar at the Collège de France in 1864; a member of the Academy of Inscriptions and Belles Lettres in 1875; from 1879 to 1888 was an inspector-general of higher education; and in 1890 was made commander of the Legion of Honor. Among his writings are 'Le mythe d'Œdipe' (1864); 'Dictionnaire étymologique latin' (1885; 5th ed. 1902); 'Deux études sur Goethe' (1898); 'Pour mieux connaître Homère' (1906) and 'Essai de sémantique: science des significations' (Paris 1897; 3d ed., 1904; English translation by Mrs. Cust, with preface by Portgate, London 1900), a work which ranks Bréal as the founder of the science of semantics or semasiology which treats systematically and scientifically the development of the meaning of words.

BREAM, a sluggish fresh-water fish (*Abramis brama*) of the carp family, common in European lakes and rivers, and especially numerous in the English fens, where it finds all the conditions most favorable, and reaches a weight of seven or eight pounds. It is edible but too lethargic to afford sport. Another species (*A. blicca*) is smaller, silvery white, and a favorite with those who enjoy quiet angling. In the United States the term «bream» is given rather indefinitely to several minnows and sunfish; and to various marine fishes, better known as sea-breams.

BREAST, in female animals, a glandular structure, containing structures for the secretion of milk, and excretory ducts, which open by small orifices in the nipple, and discharge the secreted fluid for the nourishment of the young. At the centre of each breast there is a small projection, the nipple, and this is surrounded by a dark ring termed the areola. The nipple is the part which the infant seizes in its mouth, and through the passage of which the milk flows into the mouth of the child in the act of suction. The glandular structure of the breast is covered by fat, except at the forepart of the nipple and the integument. The breast is liable to many diseases, from irritation during nursing, bruises of the part, undue pressure from tight clothes and from constitutional causes. Inflammation of the breast is very common during nursing, chiefly resulting from uncleanliness, i.e., infection. This may bring about either a local irritation, sore nipples, etc., or by extension into the substance of the breast cause abcess. Cancer frequently develops in the breast and usually manifests itself in its early stages, as a painful, hard nodule. Such nodules should be examined by a surgeon when observed. All nodules are not cancerous. See MAMMARY GLANDS.

BREAST-WHEEL. See WATER-WHEEL.

BREASTED, James Henry, American orientalist and historian: b. Rockford, Ill., 27 Aug. 1865. A.B. Northwestern College, 1888; studied at the Chicago Theological Seminary (particularly Hebrew), 1888–90; A.M. Yale, 1892; Ph.D. University of Berlin, 1894; hon. B.D. Chicago Theological Seminary, 1898; orientalist at University of Chicago since 1894; professor of Egyptology and Oriental history, director of the Haskell Oriental Museum, and chairman of the department of Oriental languages and literatures. Collecting for University of Chicago in Egypt, 1894–95; Thomas lecturer, Richmond (Va.) College, 1897; was appointed (1900) on mission to the museums of Europe by the commission of Royal Academies of Germany (Berlin, Leipzig, Munich, Göttingen), to copy and arrange the Egyptian inscriptions in those museums in preparation for the Egyptian dictionary, for the completion of which the Academies were commissioned and endowed by the German Emperor; director of the Egyptian Expedition, University of Chicago, 1905–07; corresponding member of the Royal Academy of Sciences, Berlin, 1907. Morse lecturer Union Theological Seminary, 1912. Assistant editor *American Journal of Semitic Languages.* Vice-president of the American Oriental Society, 1915–17; president of the Egyptian Research Account (American Branch), 1915; member of the American Institute of Social Science. Author ‹De Hymnis in Solem sub Rege Amenophide IV Conceptis› (1894); ‹A New Chapter in the Life of Thutmose III› (1900); ‹Ancient Records of Egypt› (5 vols., 1905); ‹A History of Egypt› (1905, 2d ed. 1909, German ed., 1911, French and Russian editions delayed by the War; edition for the blind, 1911); ‹Egypt Through the Stereoscope› (1905); ‹The Battle of Kadesh› (1905); ‹The Temples of Lower Nubia› (1906) ‹A History of the Ancient Egyptians› (1908); ‹The Monuments of Sudanese Nubia› (1908); ‹Development of Religion and Thought in Ancient Egypt› (1912); ‹A Short Ancient History› (1914); ‹Ancient Times: A History of the Early World› (1916). Also articles in *Zeitschrift für Aegyptische Sprache; Proceedings of the Society of Biblical Archæology,* London; the *American Journal of the Semitic Languages; The Nation; American Historical Review; Journal of the American Oriental Society.*

BREASTPLATE, a piece of defensive armor covering the breast, originally made of thongs, cords, leather, etc. (hence lorica, cuirass), but afterward of brass, iron or other metals. It may be considered as an improvement of the shield or buckler, which was borne on the left arm and moved so as to protect successively all parts of the body. It being perceived that the free use of both hands in the employment of offensive weapons was important, the defensive armor was attached to the body and received different names from its position, use, etc., as, for instance, breastplate, cuisses, greaves. These different species of defensive armor are of little use against firearms and have therefore generally fallen into disuse in modern war. (See CUIRASS). Breastplate, in Jewish antiquity, was a folded piece of rich, embroidered stuff worn by the high-priest. It was set with 12 precious stones bearing the names of the tribes. It was also called the breastplate of judgment, because is contained the Urim and Thummim. See COSTUME, ECCLESIASTICAL.

BREASTWORK, in military art, every elevation made for protection against the shot of the enemy. Wood and stone are not suitable for breastworks on account of their liability to splinter. The best are made of earth; in some circumstances, of fascines, dung, gabions, bags of sand and of wool. The thickness of the work must be in proportion to the artillery of the enemy. In general it ought not to be less than 10, nor more than 18, or at most 24 feet thick. The rule of Cugnot is, that the breastwork should be so high that nothing but the sky and the tops of trees can be seen within cannon-shot from the interior of the intrenchments. If this rule cannot be followed on account of the height of neighboring mountains, the interior of the fortification ought to be secured by traverses.

BREATH (A.S. *braed,* odor, breath). The ordinary breath has a slight odor and contains nitrogen, oxygen, carbon dioxide, ammonia, water and organic impurities. In quiet breathing it probably never carries microbes. In diseases of the mouth and teeth, nose, throat, lungs and stomach, in constipation and in fevers, the breath may become offensive. Should a simple antiseptic mouth-wash or a laxative fail to remove the trouble, an underlying disease must be sought out and treated. A suitable mouth-wash is Dobell's solution or listerine. Deodorizers, like coffee, cardamon, cloves, etc., may be resorted to for temporary sweetening of the breath, but they have little effect in permanently removing the condition.

BREATHING AND HEALTH. Essential to continuance of physical being are food, water and air, and the most important is air. The supply of food may be cut off for days or weeks and life remain in the body. The quality may be poor and amount reduced, and while it affects health and perhaps reduces strength, life will not go out for a long time. Cut off the supply of air completely for 14 minutes and life becomes extinct. Change from purity of air to that which is only slightly contaminated and in an hour vitality lessens. Headache and nausea appear, and unless there is return to fresh and pure air, disintegration of tissue and physical breakdown follow. These facts are patent to all, and are referred to as a starting point to consider how breathing may be used for the establishment and continuance of perfect health. The diseases most dreaded by the medical fraternity are those of a pulmonary nature. They are, in many cases, the result of insufficient air supply and inefficient means of securing it. Diseases affecting digestion follow close upon those relating to the lungs, and these, too, can be regulated by and through breathing. Nervous disorders, likewise, succumb very readily when breathing is properly ordered.

The act of breathing is, then, so important that it should have the attention of every individual. To use it to its best advantage everyone must know something of its action and of the parts directly affected by it. There is instinctive breathing and mentally directed breathing. Every one breathes. Instinctive breathing begins at birth and continues through life. If we could always be in fresh air and have little to do we would need no more knowledge of the operation than has any animal. Even for great physical activity instinctive breathing would be sufficient, because every physical exertion would increase the rapidity and breath of the instinctive act. But we are thinking animals, and we live in conditions requiring more than ordinary physical action. Excitement, nervous movements, high living and attributes of mind cause us to throw off poisons and gases which the breathing apparatus must take care of. To dispose of these we must go beyond instinctive breathing and adopt mentally directed action.

Breath is air taken through the nose and mouth into the lungs, which are elastic sacks made of microscopic vessels suspended on the bronchial tubes in the chest. They expand and collapse as they are acted upon by organs made of muscle. When they expand they draw air into the body; when they collapse they expel air. The muscles which operate them are those of the chest. The chief one is the floor of the chest, called the diaphragm. Those next in importance are the costal muscles, located in the ribs. The next, the dorsal muscles, located in the back. Last, the pectoral muscles in the upper chest in front. The muscles already noted are those which dilate the lungs and draw air into the body. Their action produces inspiration of breath, and that action expands the chest. Their return to normal position permits the collapse of the air-cells of the lungs. Such return is, however, insufficient to cause complete collapse of air-cells and the expulsion of all air. Return is assisted, and expulsion made complete, by calling into use the abdominal muscles and those in the ribs below the diaphragm. It becomes, then, very important to know the location of the diaphragm. This organ is attached in front to the end of the breast bone. One should find this location by pressing with his fingers. Men find it easily because the ribs spread quickly where they leave the breast bone. Women find it less easily as the ribs are close together. But follow up to the point where the very end of the breast bone is located. The diaphragm attaches at the sides to the ribs. One can tell where by placing the hand flat on the side and inhaling a deep breath; that which pushes first against the hand from within is the diaphragm, which is from one to two inches lower than the level of the end of the breast bone. It attaches to the sides all around and into the small of the back, where it is a little lower than at the sides. One should study the location of the diaphragm day after day, until it is definitely fixed in mind. Many who have supposed they knew how and where to take breath by using the diaphragm will find their conception has been that it is lower than it is. The real reason for having the correct location clearly in mind is to avoid desultory and, possibly, harmful practice. The reason for repeating the examination of location so many times is that the mind may go instantly to it in order to direct voluntary inspiration and expiration. Another common error is to suppose the lungs to be located in the upper chest. Ask one if his lungs are sound and he will pound high in front. The largest portion of the lungs is in the sides and back. He pounds over the space occupied by the heart. This common error leads many who practise voluntary breathing into misdirected effort, which is liable to be harmful.

Breathing divides into inspiration and expiration. Inspiration (breath taking) is instinctive and involuntary. The latter is like the former, but it is greatly amplified and extended. Our attention now goes to voluntary inspiration. Its primary physical act is expansion of the diaphragm. Evidence of that is discovered wherever that organ connects with outer parts of the chest, in the generous expansion of those parts, and by quite a little expansion of parts of the body below the diaphragm. The latter action is caused by the pressure of the centre of the diaphragm (quite in the middle of the body) downward upon the abdominal viscera. Deep breathing, or taking large draughts of air, is always accompanied by generous spread of the body at the level of the diaphragm, and considerable spread of the portion just below that level. Few adults will do this upon the first attempt at mental direction of inhalation, because they have lost the natural habit. If they will study for a few minutes quiet instinctive (not directed) breathing, they will find they really do breathe as described above. But this is not enough for "breathing for health." It must be amplified through mental direction; on the line of instinctive breathing, only much more extensively.

The custom of taking deep breath can be developed into habit in a short time, and it should be used daily. Direct the thought during inhalation to generous expansion of the body in the neighborhood of the diaphragm, and after such expansion has begun, enlarge the sides and back above the diaphragm. Fill the lungs fully, retain the air a few seconds and exhale completely. Such complete exhalation implies that breath shall be forced out by drawing in the abdomen. After repeating the act of inspiration and expiration four or five times, which, by the way, should never be done violently, one can feel the more active rush of blood through the body. This demonstrates that the cleansing process of the circulatory system is accomplishing its work. When a good glow is established refrain from further exercise for the time, but resume it when quietness is again restored. Five or ten minutes given to this practice every morning and evening will, in a month, establish physical strength. Followed through a term of years it will rebuild the body and make it almost invulnerable against the attack of disease. Persons with weak lungs or sluggish circulation can, by this means, become rugged and very active. So far-reaching is the result that great physical strength is acquired. Even the usually expected elements of decay, as manifested in carious teeth and falling hair, are arrested or prevented. The success of all physical treatment lies in the regularity and persistence with which it is followed. In a few weeks or even in one week, the benefit will be observed, but the rebuilding of a body requires persistent practice for a year at least.

Practice of the above nature increases the lung space. Probably no new air-cells can be created, although some authorities claim that there are. The expanding power of existing air-cells is enlarged, and the muscles which cause the expansion greatly increase their power. Such expansion can be measured. It is well to take the bust measure, passing the tape-measure around the body just below the arm pits, and take measurement on the first day of each month thereafter. Comparison with previous measure will show constant increase for a full year. How great an increase to expect depends upon the person. From two to five inches in a year is usual. A more perfect measure of development is given by the spirometer which, as its name implies, is a breath-measure. It records the vital capacity of the lungs. Test measurements in over 500 students proved that every one gained in size of lungs, and many made marvelous changes in their physical condition. The spirometer records the cubic inches of air space in the lungs. Such capacity varies in accordance with the height, and is greater in men than in women. Tall people have largest lungs, ordinarily, and those who are slim, rather than stout, increase most through practice. Records show that the increase in air capacity in one year averages from 25 to 33 per cent. All this has direct bearing on health. In the lungs the air-cells are surrounded by minute blood vessels. All the blood, after its course through the body, passes to the lungs to discharge its gatherings and to receive the supply of oxygen necessary for life. It is evident that if the air supply is increased 25 per cent, cleansing and oxygenation take place more quickly and more thoroughly. It is recognized among physicians that the purity of the blood is the most important element in keeping well. Meeting the attack of bacilli is the triumph of medical science. The germ of disease is found in the blood, and in modern science inoculation for destroying such germ is the keynote. In the practice of breathing every individual has nature's method of doing what medical science does. It goes beyond that, in that breathing provides prevention as well as cure. The ounce of prevention is the most valuable. Disease germs can hardly find lodgment, and they certainly cannot propagate, in a body which is perfectly well. A feeling of lassitude and «run down» is the admonition which shows that germs are at work. Your doctor tells you to take long walks in the open air. He says in other words that oxygen must be supplied to the lungs. Much surer are we to respond to health-laws if such training as all can have has made the taking of large draughts of air possible.

Above is described inhalation and exhalation. While no attempt has been made to formulate a complete system of training, enough has been said to show what may be done. At first, daily practice should be gentle. This will bring into correct use all physical organs which govern breathing. When one realizes ease in action he should make the dual act of inspiration and expiration more generous. Expiration should now be made more complete. That is, make exhalation forceful by drawing in the abdominal muscles and lower ribs greatly. This will also cause broader inspiration. Thus the two sets of muscles will be powerfully increased, and the expanding power of the lungs will be enlarged.

When breath is imbibed in large quantities it should be retained a little time that it may purify the blood. Three or four seconds are long enough at first, but the time may be increased gradually until one can hold it 30 or more seconds. The physical act of holding the breath consists of arresting the inspiratory muscles when they have drawn breath in and refusing to allow them to return to their relaxed position. The very act of thus commanding adds to their strength. It is one of the contributing factors toward strengthening the whole body. The tendency of modern life to greater physical activity accentuates the need of symmetrical development of the lungs and their controlling forces.

BREAUX BRIDGE, La., town in the parish of Saint Martin, 40 miles southwest of Baton Rouge, on the Union Pacific Railroad. It contains two churches, a convent, convent-school, a high school. It has an ice-making establishment, a municipal water plant, concrete sidewalks and an electric-light and power plant. The government is vested in a mayor and council. The municipal revenues amount annually to $10,000 approximately. Pop. 1,800.

BREBEUF, brĕ-bĕf, **Jean de,** French pioneer missionary in North America: b. Condé-sur-Vire, Normandy, 25 March 1593; d. near Georgian Bay, Canada, 16 March 1649. He entered the Society of Jesus (Jesuits) in 1617 and in 1625 arrived in Quebec. He at once took up his abode in the Indian wigwams and has left us an account of a winter's experience with the aborigines. In the spring of 1626 he set out with the Indians on a canoe journey to Lake Huron, accompanied by Father de Noüe. He established his first mission at Ihonatiria, near Georgian Bay, but his efforts met with little success and in 1628 he was recalled to Quebec because of the dangers which then threatened to exterminate the colony. On the surrender to the English in July 1629, Brebeuf returned to France, but returned after the restoration of the colony to France in 1633. The next 16 years of labor among the savages were a series of privations and sufferings. In 1640 he set out with Chaumonot to evangelize the Neutres, a tribe that lived north of Lake Erie, but his labors there during a terrible winter brought no success. In 1642 he was given the care of the Indians at the Sillery Reservation. During the Huron-Iroquois War Brebeuf succeeded in reaching the Huron country after Bressani and Jogues had failed. In 1648 disaster after disaster befell the missionaries — their establishments were burned and the missionaries slaughtered. During the attack on Saint Louis, Brebeuf and Lallemant, who had remained when they might have escaped, were seized and dragged to Saint Ignace. Brebeuf had scalding water poured on his head in mockery of baptism, and other unspeakable tortures were inflicted upon him while tied to a stake with a fire lighted under him. His head is still kept as a relic at the Hôtel-Dieu, Quebec. Consult Bancroft, ‹History of the United States› (Boston 1853); Charlevoix, ‹Histoire de la Nouvelle France› (Eng. trans. by Shea, New York 1871); Rochemonteix, ‹Les Jesuites et la Nouvelle France› (Paris 1896).

BRECCIA, brĕ'chạ, connected with breach and *break,* a conglomerate composed of angular pieces of the same or of different rocks, united by a cement or matrix, which, according to its nature, forms the several varieties of calcareous, silicious, etc. The cementing material may consist of calcite, iron oxide, quartz or various kinds of clay. The conglomerate known by the name of pudding-stone differs from that of breccia only in having the composing fragments rounded. Calcareous breccia is often found in the form of fine marble, apparently composed of fragments produced by some disrupting force, and then united by the infiltration of carbonate of lime among them. The angular form of the fragments seems to indicate that they have never been exposed to much friction, and have therefore probably originated at no great distance from their present site. In some cases a kind of spurious breccia has been formed by the breaking up of calcareous beds, and their subsequent union by means of infiltration, without any change of their original position. Marble breccia thus formed is remarkable for the size of its fragments. In the calcareous districts of many countries caverns and extensive fissures are seen filled with a reddish mass, composed of lime, sand and oxide of iron, enclosing angular fragments of different rocks, and a great number of bones more or less broken. To such masses the name of osseous breccia has been given. They are most frequently met with on the shores of the Mediterranean. Brecchia is formed by the breaking of rock into angular fragments by dynamic action and cementation; by angular blocks thrown from volcanoes and afterward consolidated; by a process similar to that of conglomerate; by the hardening and breaking into fragments of the surface of a lava flow and its subsequent burial in the soft magma; by the cementation of the loose fragment, always angular in form, of screes or talus slopes; by fragments broken from the walls of intruding igneous rocks and caught in the molten mass.

BRÉCHE DE ROLAND, brěsh dė rō-län′, «the breach of Roland,» a defile in the Pyrenees, between France and Spain, which, according to a well-known legend, was opened up by Roland, one of the paladins of Charlemagne, with one blow of his sword Durandal, in order to afford a passage to his army in the fight at Roncevalles. It is an immense gap between the walls of a mountain barrier rising to the height of 9,500 feet above the level of the sea, and from 300 to 600 feet above the bottom of the defile. The defile itself varies in width from 200 to 300 feet. It lies about 43 miles north of Huesca, from which it can at times be seen.

BRÉCHIN, breн′n, Scotland, a parliamentary and municipal burgh in Forfarshire, romantically situated on the left bank of the South Esk, 12½ miles northeast of Forfar, and eight west of Montrose. It is a very ancient royal burgh, and was formerly walled. The chief industry is the manufacture of linens; there are also distilleries, and the neighborhood exports a considerable quantity of grain. In ancient times there was an abbey of Culdees in this place, and in 1150, when Brechin was constituted an episcopal see by David I, it is supposed that the site of this establishment was that chosen for the foundation of the cathedral. The cathedral church of Saint Ninians, which now forms the parish church, is situated on the north edge of a precipitous ravine, which separates the burgh-lands from those of Brechin Castle, the seat of the Earl of Dalhousie. The ancient round tower, which is the leading architectural feature of the town, stands at the southwest angle of the church. Such towers are common in Ireland, but are seldom seen in Scotland. The Mechanics Institution is a handsome building, with a beautiful hall, and there is a valuable public library. Dr. Thomas Guthrie, the celebrated preacher, was a native. Pop. 8,439.

BRECK, James Lloyd, American clergyman: b. Philadelphia, 27 June 1818; d. Benicia, Cal., 30 March 1876. He was graduated at the University of Pennsylvania in 1838, and at the General Theological Seminary, New York, in 1841. The same year he went to Wisconsin, and aided in the formation of the diocese there in 1847. He was one of the founders of the Nashotah Theological Seminary, remaining as instructor there until 1850, when he went to Saint Paul, Minn., as a missionary. There he established an associate mission, and assisted in supplying mission stations for 80 miles around. From 1852 to 1857 he was engaged in missionary work among the Chippewa Indians. In 1858 he established church services at Faribault, Minn., and founded the Seabury Divinity School. He prepared the way for building church institutions there, and was the forerunner of Bishop Whipple. In 1867 Dr. Breck went to Benicia, Cal., where he established church enterprises similar to those at Nashotah and Faribault.

BRECK, Samuel, American soldier: b. Middleborough, Mass., 25 Feb. 1834; d. 23 Feb. 1918. He was descended from Edward Breck, who came to Dorchester, Mass., about 1630. He was graduated at West Point 1855, and took part in the Seminole War of 1855–56. During the Civil War he was assistant adjutant-general of McDowell's division, and afterward of the 1st Army Corps, being engaged in the occupation of Fredericksburg and in the Shenandoah Valley expedition, to intercept the retreat of the Confederate forces under General Jackson in 1862. From July 1862 to 1870 he was assistant in the adjutant-general's office at Washington, in charge of rolls, returns, books, blanks and business pertaining to the enlisted men of the regular and volunteer forces, and engaged in the preparation and publication of the ‹Volunteer Army Register.› He became brigadier-general and adjutant-general in 1897, and was retired by operation of law, 25 Feb. 1898. He published ‹Genealogy of the Breck Family› (1887).

BRECKENRIDGE, Hugh Henry, American artist: b. Leesburg, Va., 6 Oct. 1870. Studied in the schools of the Pennsylvania Academy and with Bougereau, Ferrier and Doucet in Paris. Instructor in drawing and painting in the Pennsylvania Academy of the Fine Arts, Philadelphia, since 1894. Awarded European scholarship, Pennsylvania Academy; first class Toppan prize, Pennsylvania Academy; medal, Atlanta Exposition, 1895; honorable mention, Exposition Universelle, Paris, 1900; medal, Pan-American Exposition, Buffalo, 1901; Corcoran prize, Society of Washington Artists, 1903; gold medal, Art Club of Philadelphia, 1907; first prize, Washington Water Color Club, 1908; silver medal, International Exposition, Buenos Aires, S. A., 1910; gold medal, Panama-Pacific International Exposition, San Francisco, 1915. Member of the jury of selection for the Pan-American Exposition, Buffalo, 1901; member of the New York Water Color Club; the Philadelphia Water Color Club; the fellowship of the Pennsylvania Academy of the Fine Arts; the Philadelphia Sketch Club; associate of the National Academy of Design; member of the jury of selection, United States section, department of art, and of the international jury of awards, Universal Exposition, Saint Louis, 1904; member of the municipal art jury of Philadelphia; member of the advisory committee for Pennsylvania and the Southern States, and of the jury of selection, department of art, Panama-Pacific International Exposition, San Francisco, 1915. Represented in the Saint Louis Club, Saint Louis; University of Virginia; Art Club of Philadelphia; University of Pennsylvania; Memorial Hall, Hartford, Conn.; University Club of Indianapolis; Jefferson Medical College, College of Physicians, College of Pharmacy, Historical Society, Pennsylvania Hospital, Philosophical Society and in the city hall, Philadelphia; courthouse, Reading, Pa.; State Normal School, West Chester, Pa., and in collections in New York, Chicago, Pittsburgh, Cleveland, etc.

BRECKENRIDGE, Lester Paige, American mechanical engineer: b. Meriden, Conn., 17 May 1858. He completed his studies at the Sheffield Scientific School of Yale University where in 1909 he became professor of mechanical engineering, after having been instructor in Lehigh University in 1882; professor of mechanical engineering at the Michigan Agricultural College, 1891–93; professor at the University of Illinois, 1893–99, and director there 1905–09 of the engineering experiment station. The dynamometer car was designed by him in 1897–99, and he invented an automatic recording machine in 1901. Among his writings are ‘High Speed Tool Steels’ (1905); ‘Fuel Tests with Illinois Coal’ (1908); ‘Steaming Test of Coals and Related Industries’ (1912) and ‘An Extension of the Dewey Decimal System of Classification Applied to the Engineering Industries’ (1899: 6th ed., 1912).

BRECKENRIDGE, Minn., village and county-seat of Wilkin County, on the Red River of the North, about 50 miles south of Fargo, N. D. It is reached by the Northern Pacific and Great Northern railroads and is the centre of a very fertile region. It contains flour mills, grain elevators, etc., and steamboats ply between it and the Red River towns in Manitoba. The waterworks and electric-lighting plant are the property of the municipality. The village is under the commission form of government. Pop. (1920) 2,401.

BRECKINRIDGE, Clifton Rodes, American legislator and diplomatist; b. Lexington, Ky., 22 Nov. 1846. He is a son of John Cabell Breckinridge (q.v.), and received a public school education and served in the Confederate army and navy. After the war he attended Washington College (now Washington and Lee University) for three years, and engaged in mercantile business in Pine Bluff, Ark. He was elected to Congress in 1882 as representative-at-large, as a Democrat; was re-elected in 1884, 1886, 1889, 1890, 1892 and 1894, and served on the Committee on Ways and Means during the greater part of his congressional life. He was United States Minister to Russia 1894–97, and from 1906 to 1916 president of the Arkansas Valley Trust Company.

BRECKINRIDGE, or **BRECKENRIDGE, John,** American statesman: b. Augusta County, Va., 2 Dec. 1760; d. Lexington, Ky., 14 Dec. 1806. In 1795 he was made attorney-general of the new State of Kentucky, and he served in its legislature from 1797 to 1800. He entered the United States Senate in 1801, becoming four years later Attorney-General in Jefferson's Cabinet, in which office he died.

BRECKINRIDGE, John, American clergyman: b. Cabell's Dale, Ky., 1797; d. 4 Aug. 1841. He entered the Presbyterian ministry, and was chaplain of the National House of Representatives, 1819–21. He was pastor at Lexington, Ky., 1823–26, and in Baltimore 1826–31. He was professor of theology at Princeton Theological Seminary (1836), afterward held official posts in Presbyterian Church, and was chosen president of Oglethorpe University, Georgia, just prior to his death. He is remembered for a famous theological debate held with Rev. John Hughes, subsequently archbishop of New York, published under the title ‘Roman Catholic Controversy’ (1836).

BRECKINRIDGE, John Cabell, Vice-President of the United States, grandson of John Breckinridge: b. near Lexington, Ky., 21 Jan. 1821; d. Lexington, Ky., 17 May 1875. He practised law in Lexington until 1847, when he was chosen major of a volunteer regiment for the Mexican War. He sat in Congress in 1851–55, and in 1856 was elected Vice-President, with James Buchanan as President. In 1860 he was the pro-slavery candidate for the presidency, receiving 72 votes, and being defeated by Abraham Lincoln. A United States senator from March to December 1861, he then entered the Confederate army, was appointed a major-general in 1862. At the battle of Shiloh he commanded the reserve, fought at Murfreesboro and at Chickamauga in the spring of 1864, defeated Sigel near New Market, was with Lee in the Wilderness, and Early's second in command in the Shenandoah campaign. He was Secretary of War in Jefferson Davis' Cabinet, at the close of the struggle, and escaped to Europe, whence he returned in 1868, and resumed his law practice.

BRECKINRIDGE, Joseph Cabell, American military officer, nephew of John Cabell Breckinridge: b. Baltimore, Md., 14 Jan. 1842. He practised law in Danville, Ky., till the beginning of the Civil War, when he joined the Union Army. He was made a first lieutenant in the regular army 1863, captain in 1874, brigadier and inspector-general in 1889, and major-general of volunteers, 4 May 1898. He served in the Santiago campaign and had a horse shot from under him. He was inspector-general of the United States army from 1899 until 1903, in which year he retired. He has since traveled extensively in Europe and Asia.

BRECKINRIDGE, Robert Jefferson, Presbyterian clergyman and theological writer, brother of John Breckinridge: b. Cabell's Dale, Ky., 8 March 1800; d. 27 Dec. 1871. He was originally a lawyer and in that capacity was for three terms a member of Kentucky legislature. On his conversion in 1828 he studied for the Church; was president of Jefferson College in 1845–47; from 1847–53 he was pastor at Lexington, Ky., and from 1853–69 professor of the Presbyterian College at Danville, Ky. He was an old-school leader in the division of the Presbyterian Church in 1837 into old and new schools. He was a strong supporter of the Union during the Civil War. His chief works were ‘Knowledge of God, Objectively Considered’ (1857); ‘Knowledge of God, Subjectively Considered’ (1859).

BRECKLING, Friedrich, German theologian: b. Hanved 1629; d. at The Hague, 16 March 1711. He was educated at Arndt, Königsberg, Rostock, Helmstädt, Wittenberg, Leipzig, Jena and Giessen. He made a deep study of theosophy. Later he went to Hamburg where his studies impressed him with the belief in a priestless Christianity. He finally became his father's assistant after wandering about for some years in search of knowledge; but through the influence of the priesthood he was dismissed and imprisoned (1660). He escaped and went to Amsterdam and found a charge at Zwolle, where again he was deprived of office through the same agency. He remained there, however, until 1672, when he went to Amsterdam (1670–90) and finally to The Hague (1690–1711), where he spent his time in writing and keeping up a correspondence with Spencer and Gottfried Arnold, the latter of whom he helped in his Church history. He paved the way, with his studies and theories, for Spencer whom he greatly influenced, and for the Pietistic movement.

BRECON, or BRECKNOCKSHIRE, Wales, an inland county with an area of 719 square miles. It is one of the most mountainous counties of the principality, and presents much bold and magnificent scenery. Near its centre rises the mountain called the Van or Beacon, belonging to the Black Mountains, which traverse its southern portion. It has a height of 2,901 feet, and is the culminating point of South Wales. The river Wye forms a natural boundary between this county and Radnor, and the Usk, rising in the Black Mountains, crosses the county and flows through a fine valley toward the town of Brecon. About two miles east from the latter is Brecknock Mere, one of the largest lakes in South Wales, abounding in otters, pike, tench, perch and eels. A considerable quantity of agricultural produce is sent to the markets in the neighboring English counties. The chief manufactures are coarse woolen, stockings and other worsted stuffs; there are also extensive ironworks. Coal, iron and lead are mined. Chief towns, Brecon, Builth, Crickhowell, Hay and Llanelly. Pop., half of whom speak Welsh, 65,999.

BRECON, or BRECKNOCK, Wales, the capital of Brecknockshire, an inland county, stands in an open valley at the confluence of the Honddu and Usk, and consists chiefly of three principal and several minor streets. Three bridges span the Honddu and one the Usk. The principal edifices are the county hall, county jail, barracks, Christ's College (an important educational institution on the model of the large public schools), and the Independent Theological College. Saint John's Church is a fine old building, cruciform, with a massive tower, partly early English, partly in later style. At Brecon the celebrated actress, Mrs. Siddons, was born, as was also Dr. Thomas Coke, the first Wesleyan missionary bishop in America. Pop., municipal borough (1911) 5,776.

BREDA, Holland, town in the province of North Brabant, 24 miles southwest of Bois-le-duc, on the Merk. Being a strong frontier fortress, it was formerly of the greatest importance to Holland, as the chief point of the line of fortresses in front of the Meuse. The fortifications consisted of 15 bastions, as many ravelins, and five horn-works, besides the citadel. These being removed, the chief strength of the place now lies in its marshy environs, which may easily be laid under water. Breda received city rights in 1534; and since that time has often been a subject of contention between the Dutch, Spaniards and French. It was delivered by treachery into the hands of the Duke of Parma in 1581, but was retaken by Maurice of Orange in 1590. The latter capture was accomplished by means of a boat loaded with turf, in which 70 Dutch soldiers were concealed. Spinola took Breda in 1625, after a siege of 10 months, but it was retaken by the Dutch under Frederick Henry of Orange, in 1637. During the French Revolutionary War Dumouriez made himself master of the city and fortress in February 1793, and would thereby have prepared the way for the conquest of Holland had he not been forced, by the loss of a battle at Neerwinden, to evacuate the city and fortress, 4 April. In September 1794 Breda was attacked by the army of Pichegru, but did not surrender till all Holland was conquered, in the winter of 1795. On the approach of the Russian vanguard, under General Benkendorf, in December 1813, the French garrison made a sally, and the patriotic citizens, profiting by the occasion, rose *en masse,* shut the gates and prevented the French from returning into the town. A peace was concluded at Breda between England and Holland in 1667. Breda has manufactories of carpets, cloth, cigars, and its good harbor has greatly aided its trade development. Pop. about 28,000.

BREDA, Declaration of, a proclamation of amnesty issued by Charles II of England, 4 April 1660. It was the only guarantee which the English nation demanded when taking back their ejected kings of the faithless race of Stuarts. It was read in Parliament with an effusive display of respect and thankfulness. In it Charles promised a general amnesty and liberty of conscience, with such exceptions and limitations only as the Parliament should think fit to make. All delicate questions, among others the proprietorship of confiscated estates, were in like manner referred to the decision of Parliament, thus leaving the King his liberty while diminishing his responsibility. Though fully asserting the ancient right of the Crown, Charles announced his intention to associate the two Houses with himself in all great affairs of state. Consult Guizot, ‘History of Richard Cromwell and the Restoration.’

BREDAHL, brā-däl', **Christian Hviid,** Danish poet: b. Hellestrup 1784; d. 1860. He was educated at the gymnasium and the University of Slagelse. Owing to his love for an outdoor life, he turned his attention to agriculture and in 1824 he bought a small piece of land near Sorö, which he cultivated himself. His great work is ‹Dramatiske Scener,› which was published in six volumes, the first volume appearing in 1819. He also published several polemical works, directed against the Danish romanticism and the realistic writings of the time. In all his works, he shows a love for nature and the natural conditions of life, and a dislike for modern culture; his ‹Dramatiske Scener› attacks both the nobility and the priesthood. A new edition was published in 1885 in three volumes at Copenhagen.

BREDENKAMP, Konrad Justus, German Lutheran theologian: b. Basbeck, Germany, 26 June 1847; d. Verden, 25 March 1904. Educated at the universities of Erlangen, Göttingen and Bonn, he became pastor at Kuppentin (1872–78), Göttingen (1879) and Erlangen (1880–83), when he was appointed professor of theology at Greifswald (1883–89). He then went to Kiel as professor of Old Testament exegesis (1889–1904). Among his published works are ‹Der Prophet Sacharja erklärt› (1879); ‹Vaticinium quod de Immanuele edidit Jesaias› (1880); ‹Gesetz und Propheten› (1881); and ‹Der Prophet Jesaias erläutert (1887).

BREDOW, brā'do, **Adalbert von,** German soldier-hero: b. Berlin 1814; d. 1890. He distinguished himself at the battles of Trautenau and Sadowa as cavalry commander during the War of 1866, but his most brilliant feat which is commemorated in song and story occurred in 1870 when as commander of the 5th Cavalry Division, with barely six squadrons, he led the desperate charge at Mars-la-Tour during the Franco-Prussian War, which made a large division of the French army powerless to assume the offensive. Bredow was made lieutenant-general in 1871.

BREDOW, Gabriel Gottfried, German historian: b. Berlin, 14 Dec. 1773; d. Breslau, 5 Sept. 1814. He was for a time professor at Eutin and a colleague of the celebrated Voss; afterward professor at Helmstädt, and (1809) at Frankfort-on-the-Oder, whence he went to Breslau on the removal of the university to that place. He was distinguished for his patriotism and his literary works. His ‹Handbuch der alten Geschichte› (‹Manual of Ancient History›) passed through five editions, the fifth of which appeared in 1825. He was the author of ‹Chronik des neunzehnten Jahrhunderts› (‹Chronicle of the 19th Century›); ‹Epistolæ Parisienses›; ‹Untersuchungen über Geschichte, Geographie, und Chronologie› (‹Researches in History, Geography, and Chronology›); and of the very useful ‹Historische Tabellen› (‹Historical Tables›), which were translated into English.

BRÉE, brā, **Matthæus Ignatius van,** Belgian painter: b. Antwerp 1773; d. there 1839. He chiefly excelled in historical painting. His characteristics are said to have been originality and vigor of conception and patience in execution; and he excelled in sculpture and lithography. His first work which attracted attention was the ‹Death of Cato.› Among his principal works are ‹Rubens Dictating his Dying Testament›; ‹The Tomb of Nero at Rome; ‹Death of Count Egmont›; ‹Van der Werff Addressing the Famished Populace During the Siege of Leyden.› He was appointed professor in the academy at Antwerp in 1804, and director in 1827.

BREECH and **BREECH-LOADER.** See ARTILLERY; MUSKET; RIFLE; SMALL ARMS.

BREECHES, a garment for the legs, especially, as distinguished from trousers, for covering the upper portions of the legs. In England they were formerly called hose. Breeches or hose were in use even among the ancient Babylonians, and with them were made so as to cover the foot and supply the place of stockings. In Europe we find hose first used among the Gauls, hence the Romans called a part of Gaul breeched Gaul (*Gallia braccata*). In the 5th century they had become fashionable in Rome. In the time of Queen Elizabeth and James I the breeches had assumed enormous dimensions, being stuffed out with various materials, as wool, hair, etc. King James' partiality for such breeches is well known, and we find him represented in an old engraving with wide stuffed breeches tapering to the knee, slashed and adorned with lace. In the reign of Charles I they took the form of short trousers, loose at the knee, and ornamented with ribbons, lace, etc. In the time of William III the tight knee-breeches came in, and have been supplanted by trousers only in the 19th century.

BREECHES BIBLE, a name given to the Geneva version of the Bible, published in 1560, and so called from the reading of Gen. iii, 7: «They sowed figge tree leaves together and made themselves breeches.» As a matter of fact this Bible has no more distinctive right to the name than Wyclif's version, in which the same words are also found. It was the common English version until its supersession by the authorized version in 1611.

BREECHES BUOY. See LIFE SAVING SERVICE.

BREED, David Riddle, American Presbyterian divine, author and hymnologist: b. Pittsburgh, Pa., 10 June 1848. A graduate of Hamilton College, 1867, and of Auburn Seminary, 1870; after pastorates in Saint Paul and Chicago, he became pastor of the First Presbyterian Church of Pittsburgh in 1894. He received the appointment of professor of practical theology in Western Theological Seminary, Allegheny, Pa., in 1898, and was prominently identified with the denominational Board of Missions for Freedmen. His works on hymnody include ‹History and Use of Hymns and Hymn Tunes› frequently reprinted; among other writings are ‹Abraham, the Typical Life of Faith› (1886); ‹History of the Preparation of the World for Christ› (1891); ‹Heresy and Heresies› (1891); ‹Preparing to Preach› (1911); and chief of numerous tracts is the widely circulated ‹More Light.›

BREED, Robert Stanley, American biologist: b. Brooklyn, Pa., 17 Oct. 1877. He studied at Amherst College, the University of Colorado and Harvard University; was appointed professor of biology at Allegheny College, and became secretary of the faculty 1907–10. His articles in scientific journals on the public milk supply and his studies on the post-embryonic development of insects made him widely known. He is the author of 'The Changes which Occur in the Muscles of a Beetle during Metamorphosis' (1903).

BREEDE, a river in Cape Colony, which rises in the Warm-Bokkeveld, and flows chiefly in a southeasterly direction through the district of Zwellendam, entering the Indian Ocean at Saint Sebastian's Bay, about 60 miles northeast of Cape Agulhas, the most southerly point of Africa. It is navigable for vessels drawing not more than 10 feet of water to a distance of 40 miles, and drains a very fertile district.

BREEDING, the process of organic procreation. In this article the physiology of the matter is not to be considered, however, but only the methods and results as applied to the reproduction of domesticated animals and plants on varietal lines in accordance with human requirements or fancy — that is, *selective breeding.* When men first began to keep flocks and herds and pet-animals, which were subjugated rather than domesticated as yet, reproduction was no doubt left wholly to nature, as still is the case on the vast cattle ranches of South Africa, Argentina and in America. But very early in the history of pastoral life (which, doubtless, was the first rise above savagery) selective influences must have begun to operate, especially in the case of those animals which are most closely associated with their owners, and therefore most constantly under observation and control. Not only from the earliest times of Egyptian and Oriental record, but long previous, as shown by sub-fossil remains, distinct varieties of dogs, horses, camels and cattle had been produced from their original wild stocks. This might have come about in part naturally as a result of migration of bands to novel climates and food, to inbreeding and to other influences entailed by even a semi-domesticated condition; yet, no doubt, a rough sort of selective breeding began with the earliest domestication of live stock, poultry, etc. Favorites would be preserved when, in times of stress, others were killed for food. Owners fancying bigness, or speed, or a special color or some other quality in certain of their animals would try to get more of that particular kind. In both cases the saving of these better ones would, when they came to breed, strengthen the collection until a noticeable strain had been evolved without any definite intention or action by the owner.

It is probable, moreover, that observation and reasoning — in neither of which faculties was the primitive herdsman deficient within the limits of his experience — would soon suggest to him some advantageous choice of mates among his animals; and there is no question that selective breeding was understood in a practical way at the dawn of history. It is most strikingly manifested in the care taken in ancient as in modern times in southwestern Asia, and in northern Africa, to keep pure and perfect the standard breeds of horses and camels. Little progress was made in Europe in this direction, for various reasons, previous to or during the Middle Ages, and no one with influence made any study of the principles that underlie that proverb of contented credulity — «Like begets like.» Men were accustomed to choose as progenitors the best specimens available of the type they preferred, and were thankful when they got satisfactory progeny. The first attempt at scientific treatment of the matter was that of Robert Bakewell in England, who, about the middle of the 18th century, studied and formulated the peculiarities of certain breeds of cattle, and showed how a male and a female excelling alike in the one or more selected characteristics must be used if the offspring were to progress along that desired line. Thus was begun the now familiar practice of systematically «breeding for points» — that is for the standard characteristics by which a breed (that is, an artificial variety) of any animal is distinguished. Such a breed, when finally attained, continues to perpetuate its distinctive form, or, as they say, «breeds true,» by virtue of the laws of heredity. These laws cannot be discoursed of here, but a few words of explanation may be permitted. While it is true in general that «like begets like,» it is not so in all particulars. No two young are precisely like their parents, or exact duplicates of one another. Individual variations appear in size, color, proportions and temperament. Some differences are rarely noticeable, for some physical features are apparently too fundamental to suffer any perceivable alteration — teeth or eyes (except as to color) for example; other more superficial and plastic features frequently show diversities. The art of the breeder, who desires an improvement in a certain kind of domestic animal, either for increased usefulness, or for some fanciful end, is to recognize and profit by emphasizing some one of the plastic features, and to cultivate it at the expense of other features. To do this he selects a pair that show a little more than others the desired quality. Some of their offspring are likely to exhibit this quality better than others of the litter, and these are mated. So progressive generations go on advancing the desired feature and eliminating undesirable ones. See HEREDITY; MENDEL'S LAW.

Now the theory of this is that the qualities of the parents are transmitted to the young in virtually the same proportion as they exist in the parents, but not with exact equality. Some young, either of the same or in successive births, will get a little more of quality A, others a little more of quality B, than the rest. If in the next generation one with a superabundance of quality A mates with one having an excess of quality B, the balance will be restored; and this is what usually happens in nature, so that variations are almost sure to be speedily extinguished. If, however, sovereign man sees to it that A mates with another A, then their young will be doubly endowed with that quality; and if the process is continued that quality will finally predominate, and will be maintained so long as outside mating is prevented.

In practice, however, the matter is not quite so simple. Some animals resist change, or may be modified up to a certain point, and no further in that direction, as in the well-known case of the blue Andalusian chickens, which will not breed true. It must be remembered, also, that negative as well as positive characters are transmissible, the weaknesses as well as the strength. Sometimes a fault seems inseparable from the sought-for virtue, as in the prevalent deafness of white cats.

The evidence as to inheritance of disease is too conflicting to be determinative. Probably no disease or its resulting lesion is transmitted; but a weakness of resistance, which amounts to a tendency, or at least a susceptibility to that disease, often develops in the descendants of animals afflicted with certain ailments, as ringbone in horses. Domestication has an effect on the procreative ability, or, at any rate, on the fecundity of animals, sometimes reducing it, but more often increasing it, owing, no doubt, to safer conditions and better food than the same creatures had in the wilderness; and the production of special breeds has occasionally been followed by exaggerations of this tendency. In varieties produced by hybridizing it is almost a rule that they are sterile. The more perfect in show-points is a kennel of toy-dogs the more delicate in health are they, and the harder it is for them to beget and nurture their puppies.

The mere production of a fixed artificial variety of animal is one thing, and the making of a strong, useful and valuable breed is quite another. It is probable that few new ones of practical importance will be effected.

Plant-breeding, or the establishment of new forms of plants, depends on essentially the same principles as have been outlined. The principal difficulty in producing a new variety of flower or fruit is to prevent mixture by the introduction of foreign pollen — the fertilizing element; but this may be guarded against. One source of a new variety is by seizing upon some conspicuous accidental variation in a plant, called by horticulturists a «sport,» isolating it, and perpetuating it by some of the methods presently to be mentioned. Many well-known flowers and fruits have originated from such sports. «On an ordinary orange tree, not so many years ago, a single bud produced a branch which bore only seedless fruit, . . . correlated with the presence of a tiny accessory orange embedded almost wholly in the larger; that branch was grafted, as were the resulting branches; and this is the origin of . . . the navel orange» (*Ganong*).

Reproduction by grafting or by cuttings is one method, then, of plant-breeding; but more commonly the new variety is originated or brought to perfection, or both, by artificial pollination — transferring by human agency desirable pollen to the stigma of the plant to be affected, whence it descends and fertilizes the seed. This is done in most cases by touching the anthers of a ripe flower with a soft, camel's-hair brush, and then touching the stigma to be affected, to which the conveyed pollen will stick. In some special cases the pollen of the plant's own flower is used; this ensures non-variability, and is called «inbreeding»; but as a rule the pollen from another plant of the same kind is taken. This is «cross-pollination,» and tends to make an equally true and more vigorous stock, with an increased tendency to (controllable) variation. Thirdly, the breeder may pollinate a given stigma from a different variety, or even (but not always) from a different species of plant. This is «hybridization,» and the result is a «hybrid»— the source of many of the remarkable varieties of plants that Luther Burbank and other scientific gardeners and experimenters have given us. It is the rule, however, as among animals, that these hybrids do not produce seeds, and must be perpetuated by planting bulbs or cuttings, or in the case of trees, by grafting, generation after generation. Success in these methods can be obtained only by preventing all access to the stigma, and thence to the seeds of the plant operated on, of any pollen except of the one kind needed. This is most usually accomplished by simply enclosing the blossom to be treated in a cap or bag of paper or light gauze, so that no flying pollen or pollen-loaded insects can reach it.

In this review of methods the writer has necessarily given an impression of extreme simplicity, but the road to success abounds in difficulties and often tries the patience of the experimenter by its length.

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ERNEST INGERSOLL.

BREEDING, Plant. See PLANT BREEDING.

BREED'S HILL, Mass., a slight elevation in the Charlestown district of Boston, about 700 yards from Bunker Hill. Although the famous engagement of 17 June 1775 is known as the Battle of Bunker Hill, the fighting was done on Breed's Hill. Here was located the American redoubt, against which the British made their three historic charges, and here Warren fell. Bunker Hill monument stands on Breed's Hill.

BREESE, Kidder Randolph, American naval officer; b. Philadelphia, 14 April 1831; d. 1881. He entered the navy in 1846 and served in the Civil War. In 1861 he commanded the third division of Porter's mortar flotilla in the attacks on New Orleans and Vicksburg; in 1863 and 1864 he was lieutenant-commander on the *Mississippi* and took part in the most important engagements; in 1865 he was fleet-captain at the attack on Fort Fisher. He became captain in 1874.

BREEZE-FLY. See BOT-FLY.

BREFELD, brā'fĕlt, **Oskar,** German botanist: b. Telgte, Westphalia, 19 Aug. 1839. He was educated at Halle, Munich and Würzburg. In 1875 he was a lecturer at Berlin; in 1878 he became professor at Eberswald, in 1884 at Münster and in 1898 at Breslau. He retired in 1907. His investigations have been chiefly in mycology and he introduced a number of new methods in the study of this science, particularly the use of «gelatine cultures.» He has written ‹Researches in the Field of Mycology› (1872).

BREGENZ, brā-gĕnts', a town of western Austria, in Vorarlberg, 77 miles west by north of Innsbruck. It occupies a beautiful site on a slope which rises from the Lake of Constance and terminates on Mount Gebbard, where the ruins of the ancient stronghold of the counts of Montfort are still seen. It consists of an old town, very poorly built, and a modern, which is more attractive. Among its edifices are three churches and two monasteries, a town-hall, and a museum of Roman antiquities, found in the vicinity. Its chief manufacture is framework and other wooden fittings for houses, and it trades in corn, fruit, wine, butter and cattle. There are saltpetre works, blast furnaces and coal mines in the vicinity. Pop. of the district in 1910 was 34,743. Under the name of Brigantium the town was a Roman station, and in the Middle Ages, the seat of the powerful counts of Bregenz. In the 16th century, it passed to the house of Hapsburg. Consult Helbrook, ‘Die Bevölkerung der Stadt Bregenz,’ (Innsbruck 1912).

BREGMA. The point on the surface of the skull at the junction of the coronal and sagittal sutures. This situation is known as "bregma," and is taken as a landmark in medical and anthropological measurements.

BRÉGUET, brā'gā, **Abraham Louis,** Swiss watchmaker and mechanician: b. Neuchâtel, 10 Jan. 1747; d. 17 Sept. 1823. He originated the use of rubies in pivot holes and became celebrated for the perfect workmanship of his pocket chronometers, marine timepieces, sympathetic pendulums, metallic thermometers and mechanism of telegraphs. He established a manufactory in Paris, was appointed chronometer maker to the navy, member of the bureau of longitudes and member of the Institute.

BRÉGUET, Louis François Clément, French mechanical watchmaker, grandson of Abraham Louis Bréguet: b. Paris, 22 Dec. 1804; d. there 1883; maintained the reputation gained by his father and grandfather in the construction of nautical and other instruments of precision. He was placed in 1826 at the head of the chronometer department of the navy founded by his grandfather; invented the system of electrical clocks for the distant transmission of time, and supervised the establishment of the first telegraphic line in France. He is the author of ‘Télégraphie electrique.’

BREHM, brām, **Alfred Edmund,** German naturalist and traveler: b. Reuthendorf, 2 Feb. 1829; d. there, 11 Nov. 1884. Under his father Christian Ludwig (q.v.) he studied natural history and ornithology; traveled extensively from 1847 to 1854 in Egypt, Nubia, the Sudan, Abyssinia, Spain, Lapland and Siberia; became director of the zoological gardens, Hamburg, 1862, and from 1867 to 1874 was director of the aquarium, Berlin. His ‘Illustrirtes Thierleben’ (6 vols., Hildburghausen 1863–69), was the most important work published in that line at that date. He also wrote ‘Das Leben der Vögel’ (Glogau 1860–61; 2d ed., 1867; English translation, ‘Bird Life’ by H. M. Labouchère and W. Jesse, 4 parts, London, 1872). His books of travel include ‘Reiseskizzen aus Nordostafrika’ (3 vols., Jena 1855–63); and ‘Ergebnisse einer Reise nach Habesch’ (Hamburg 1863).

BREHM, Christian Ludwig, German divine and ornithologist: b. Schönan near Gotha 1787; d. 1864. From 1807–09 he studied theology in Jena, and afterward was pastor of several churches. He became widely known by his writings on bird life and by his collection of 9,000 European birds, in 1897 acquired for the Rothschild museum at Tring. His principal works are ‘Beiträge zur Vögelkunde’ (3 vols., 1821–22); ‘Lehrbuch der Naturgeschichte aller europäischen Vögel’ (2 vols., 1823–24); ‘Ornis’ (3 parts, 1824–27); ‘Handbuch für Liebhaber der Stuben-Haus und aller der Zähmung werten Vögel’ (1832); ‘Der vollständige Vogelfang’ (1855); ‘Die Eier der europäischen Vögel nach der Natur gemalt (collaborated with Baedeker and Passler, 1855–67).

BREHON (Irish, *breitheamh,* a judge), the name given to a magistrate among the ancient Irish. These magistrates seem to have been hereditary, and before the introduction of Christianity probably combined the offices of judge and priest. They administered justice to their respective tribes — each tribe had one brehon — seated in the open air upon some sods placed on a hill or eminence. The poet Spencer, in his ‘View of the State of Ireland,’ refers to the Brehon law as an unwritten code handed down by tradition. He was, however, mistaken in regarding it as an unwritten code. Patriarchal as was the administration of the Brehon law, its transmission was not left to tradition. In the earliest manuscripts extant it is said to have been revised by Saint Patrick and other learned men, who expunged from it the traces of heathenism and formed it into a code called the Senchus Mor, about 440, and it is implied that a previous written code, written in the ancient Irish tongue, existed. There is a great similarity between the Brehon laws and the laws of the Druids as explained by Cæsar in his Commentaries. The Brehon law was exclusively in force in Ireland until 1170. Various ineffectual attempts were made by the English government to suppress it, and it was finally abolished by James I in 1605. The Brehon laws, like other laws passed at the same period of European history, contained, with some rude principles of justice, many barbarous institutions. The state of society indicated in them seems to be a sort of transition from the communal ownership and periodical reparation of the land found among several Teutonic nations, to a manorial organization. Several distinct social ranks are indicated, ranging from the nobles to the serfs. They had regular courts, with the right of appeal from lower to higher ones. Most offenses, even including murder, could be commuted by fines, which were fixed with minute precision; but the fines were paid in kind, since coined money was unknown. The laws also carefully provide for and regulate the raising of the children of the upper classes by members of the subordinate classes. The marriage laws were of a very loose character, and the law of inheritance is obscure and complicated. Women were free to own property and to enter into contracts concerning it. Until recently these laws have been involved in great obscurity. A commission was appointed in 1852 to superintend the publication and translation of the ancient laws of Ireland; and between 1865 and 1885 an edition of the ‘Senchus Mor’ was published in five volumes. Consult Arbois de Jubainville, ‘Etudes sur le droit celtique’ (Paris 1895); Joyce, ‘Social History of Ancient Ireland’ (Vol. I, London 1903), and

Maine, ‹Early History of Institutions› (London 1875).

BREISACH, brī-zäh, or **ALT BREISACH,** town of Baden, on an isolated basalt hill (804 feet) on the right side of the Rhine, 14 miles west of Freiburg. The Mons Brisiacus of Cæsar, it was taken by Ariovistus when he invaded Gaul; being regarded as the key to western Germany, Breisach had a chequered history during the Middle Ages, passing under successive masters and being the battleground of Austrian and Frenchman in the wars of the 17th and 18th centuries. The town was burned by the French in 1793 and 12 years later they ceded it to Baden. The minster is a 13th century structure. It carries on an active trade in lumber and cattle, and manufactures beer, wall paper, wine, etc. Pop. about 5,000. Consult Coste, ‹Notice historique sur la ville de Vieux-Brisach› (1860).

BREISGAU. See Brisgau.

BREITENFELD, village of Saxony, five miles north of Leipzig. Here two battles were gained by the Swedes during the Thirty Years' War. In the first, fought on 7 Sept. 1631, Gustavus Adolphus, joined by the Saxons, defeated Tilly and Pappenheim; in the second, on 2 Nov. 1642, Torstenson, who had succeeded on the death of Baner to the command of the Swedish army in Germany, again defeated the Imperialists under the Archduke Leopold and Piccolomini, who had advanced to the relief of Leipzig, invested by the Swedes. Leipzig surrendered after the battle. Breitenfeld was also the scene of a portion of the battle of Leipzig, won by the allies against Napoleon, 16–19 Oct. 1813.

BREITHAUPT, brīt'howpt, **Johann August Friedrich,** German mineralogist: b. Probstzella, Thuringia, 1793; d. 1873. He studied at the University of Jena and at the Academy of Freiberg where, in 1813, he was appointed lapidary and teacher, and in 1827 professor. His painstaking examination of all the known minerals of his time, including over 3,000 measurements of calcite alone, contributed largely to increased knowledge of crystallography, and the opening of the vast coal fields of Zwickau, Saxony, was due to his efforts. His close researches resulted in almost total blindness toward the end of his life. His chief works are ‹Ueber die Echtheit der Krystalle› (1816); ‹Vollständige Charakteristik des Mineralsystems› (1820, 3d improved ed., 1832); ‹Die Bergstadt Freiberg› (1825, 2d ed., 1847); ‹Die Paragenesis der Mineralien› (1849), completing the work; he also contributed five chapters to Hoffmann's valuable ‹Handbuch der Mineralogie› (3 vols., 1836–47).

BREITHAUPT, Joachim Justus, German Protestant minister and poet: b. Hanover, 2 Feb. 1658; d. 16 March 1732. He was an orator of note and attracted the attention of the court. His poetry, which is for the most part sacred in character, was popular in his day and had some influence on the development of German literature. Breithaupt was professor of theology in Halle, and in this capacity he influenced, to a considerable extent, the theological thought of his generation in Germany. Among his well-known works are ‹Theses credentorum et agendorum fundamentales› (1700); ‹De perfectione partium› (1704); ‹Teologie der Wiedergeborenen,› ‹Vollkommenheil› and ‹Poemata miscellanea› (1720).

BREITKOPF, brīt'kōpf, **Johann Gottlob Immanuel,** German printer and publisher: b. Leipzig 1719; d. 1794. He was educated in the university of his native city, and following out a scientific study of printing, he evolved improvements in musical notation and in German text. To him is probably due the present form of modern printed music. In 1764 he established in Leipzig the publishing house known from 1795 as Breitkopf & Härtel. He was the author of ‹Ueber die Geschichte der Erfindung der Buchdruckerkunst› (1779); ‹Ueber den Druck der geographischen Karten› (1777–79).

BREITMAN, Hans, hänts brīt'mạn. See Leland, Charles Godfrey.

BREMA, Marie (Minny Fehrman), operatic singer: b. Liverpool, 28 Feb. 1856; father German, mother American. In 1874 she married Arthur Braun of Liverpool. Studied under (Sir) George Henschel; made her début in Schubert's ‹Ganymed,› 1891, at a concert; in the same year sang the part of Lola in ‹Cavalleria Rusticana› on its first production in England (19 October). Introduced to Mme. Wagner in 1894, she was engaged for the part of Ortud at Baireuth; also appeared as Kundry in ‹Parsifal.› As Brünnhilde in ‹Die Walküre› she toured America (1894), and appeared again in Wagnerian rôles at Baireuth in 1896 and 1897; in Brussels and Paris as Orphée, Dalila and Amneris. Perhaps her most notable achievement in the English Musical Festivals was the part of the Angel in Elgar's ‹Dream of Gerontius› (Birmingham 1900). Originally a mezzo-soprano, her vocal compass has increased to the extent that she is able to take soprano parts.

BREMEN, brā'mĕn, Germany, a port and free city, and an independent member of the empire, one of the three Hanse towns, is situated on the Weser, about 50 miles from its mouth, in its own small territory of 98 square miles, besides which it possesses the town and port of Bremerhaven at the mouth of the river. The town is divided into the old town (Altstadt), on the right bank of the river; the new town (Neustadt), on the left bank of the river, and the extensive suburbs (Vorstädte). The first is separated from the suburban quarters adjoining by the ramparts of the city, now converted into walks and pleasure-grounds, and forms a sort of semi-circle on the right bank of the river. The new town lies on the left bank of the river opposite the old, with which it is connected by three bridges, two of them crossing the main stream and the third crossing the arm of it called the Little Weser, besides a railway bridge. Extensive suburbs lie on this side also. The streets of the old town are generally narrow and crooked and lined with antique houses in the style of the Middle Ages. This is the business quarter of the city and contains the chief public buildings, including the cathedral, the old Gothic council-house, with the famous wine cellar below it, the modern town-hall, the Schütting or merchants' house, the old and the new exchange, etc. The new town has straight, well-built streets, lined mostly with dwelling-houses and shops. The suburbs also consist chiefly of dwelling-houses, and as these often have gardens in front, the streets have a very pleasant aspect. The chief ecclesiastical building is the cathedral, a Romanesque edifice, founded in 1044, subsequently added to at various times, and in 1888–93 provided with two new western towers. There are several other old and interesting churches, as those of Saint Ansgar, Saint Stephen and Saint John. Among buildings of recent erection are the courthouse, savings bank and railway station. There are several squares and open spaces, and besides the pleasure-grounds formed from the ramparts, a large public park has been laid out on the north side of the town. Bremen is well supplied with schools and other educational institutions, and possesses a museum, a library (120,000 volumes), an observatory, etc. The manufacturing establishments include tobacco and cigar factories, sugar-refineries, rice-mills, iron-foundries and machine works, rope and sail works. and shipbuilding yards. It is from its commerce, however, that Bremen derives its importance. Its situation renders it the emporium of Hanover, Brunswick, Hesse and other countries traversed by the Weser, and next to Hamburg it is the principal seat of the export and import trade of Germany. The Weser has been deepened so that sea-going ships drawing 17 feet of water can now ascend to the Bremen docks, but the great bulk of the shipping trade centres in Bremerhaven and Geestemünde. Bremerhaven is now a place of over 18,000 inhabitants, and is provided with excellent docks capable of receiving the largest vessels; it is connected by railway with Bremen, where the chief trading companies, merchants and brokers have their offices. The greater portion of the German trade with the United States passes through Bremen, and it is the chief port of emigration on the Continent. The chief imports are tobacco, raw cotton and cotton manufactures, wool and woolen manufactures, rice, coffee, grain, petroleum, wines, timber, hemp, dyewoods, skins etc., which are of course chiefly exported to other parts of Germany and the Continent. The exports are woolen goods, linens, glass, rags, wool, hemp, hides, oil cake, wooden toys, etc. Next to Liverpool, Bremen is to-day the leading European cotton market. Before the organization of the cotton exchange in 1872, the German merchants had been getting their product chiefly from Havre and Liverpool, very little being imported direct. To become independent of British ports, it was necessary to get the patronage of the inland spinners. This proved no easy task. Not until a decade had passed did the Bremen exchange cease to be a local institution and acquire a standing of national importance; but ever since the development has been phenomenal. While the importation of cotton in the year 1870 amounted to only 157,689 bales, it ran up to 397,998 bales in the year 1880. Ten years later there were 812,538 bales and when the great war broke out in 1914 had reached enormous figures. The new cotton exchange opened in 1902 is not only one of the most imposing structures of this nature in the world, but also the most complete in the appointments necessary for carrying on the business of buying and selling cotton and supplying the leading merchants and brokers with office and sample rooms. The city owns its gasworks, waterworks and electric plants. The municipal management of these has been a great benefit, yielding an increasing annual net income to the city treasury. The public schools are maintained and controlled by the city. Bremen spends almost twice as much on education as on its police force.

Bremen first rose into note about 788, when it was made the seat of a bishopric by Charlemagne. It was afterward raised to the dignity of an archbishopric, and by the end of the 14th century it had become virtually a free imperial city. At the Treaty of Westphalia in 1648 the archbishopric was secularized and became a duchy under the supremacy of Sweden. In 1731, when the Elector of Brunswick gained possession of the duchy, the privileges of Bremen as a free city were confirmed. From 1810 to 1813 it formed part of the French empire. The constitution is in most respects republican. The legislative authority is shared by the senate, a body of 16 (11 of whom must be lawyers and five merchants, elected for life) and presided over by two of their own number alternately, who have the title of burgomaster; and by an assembly of 150 citizens elected for six years. The executive power is entrusted to the senate and senatorial committees. Pop. of. the total territory (including Bremerhaven) about 248,000.

BREMER, brā'mėr, **Fredrika**, Swedish novelist: b. Tuorla, Finland, 17 Aug. 1801; d. Arsta, 31 Dec. 1865. At 17 she was taken on a tour through Germany, Switzerland and France. In 1828 appeared the first volume of her ‹Sketches of Everyday Life,› but the second volume, ‹The H. Family› (1833; English transl., 1844), first revealed her power. From this time she devoted herself to writing stories that quickly became popular in translations far beyond the bounds of Sweden, and she varied her literary labor by long journeys in Italy, England, the United States, Greece and Palestine, which supplied the materials for her ‹Homes of the New World› (1853), and ‹Life in the Old World› (1862), full of fine descriptions of scenery and vivid pictures of social life, with sound views on political and moral questions. The admirable translations of Mary Howitt had preceded her in the United States as well as England, and insured her an equally warm welcome on both sides of the Atlantic. On her return to Sweden she gave herself up to philanthropy, but more particularly to the education and emancipation of women, and the consequent propagandist character of her later novels, ‹Bertha› and ‹Father and Daughter› (1859), was detrimental in no small degree to their literary value. Her religious views she set forth in her ‹Morning Watches› (1842). She has been called the Jane Austen of Sweden. Of her stories perhaps the most perfect is ‹The Neighbors› (1837). ‹The Diary,› ‹The President's Daughters,› ‹Brothers and Sisters› and ‹Strife and Peace or Scenes in Dalecarlia,› are only less popular. ‹Lives› were published in 1868 and at Copenhagen in 1892 by Petersen. See HOME, THE.

BREMERHAVEN, brā'mėr-ha-ven, Germany, the port of Bremen, on the east shore of the Weser estuary, nearly 10 miles from the open sea and 39 miles north-northwest of Bremen. It was founded by Bremen, in 1827, on ground acquired from Hanover, and rapidly became a thriving place. A second dock was opened in 1866, a third in 1874, and in 1888 a great port, with docks, was undertaken at Nordenham, on the opposite bank. The workshops and dry docks of the North German Lloyd Steamship Company are at Bremerhaven. Shipbuilding and shipping are the principal industries. Bremerhaven was the scene, in 1875, of a dynamite explosion on board a mail steamship, by which 60 persons were killed. The Geeste separated Bremerhaven from Geestemünde. Pop. about 25,000.

BREMERTON, Wash., city in Kitsap County, 25 miles southwest of Seattle, on Puget Sound. Here is located the Puget Sound Navy Yard, covering about 250 acres and valued at $15,000,000. There is also a very large dry dock, 827 feet long. The city has a public library, several parks, including an athletic field, a skating pavilion and several theatres and churches. It has among its industrial establishments a creamery, an ice plant, sheet-metal works, paint works, machine shops, saw mills and cigar factories. Pop. (1920) 8,918.

BRENDAMOUR, brän-da-moor, **Franz Robert,** German engraver: b. Aix-la-Chapelle, 16 Oct. 1831. He was educated in his art in Cologne under Stephan. In 1856 he went to Düsseldorf and established a xylographic studio, which rapidly became well known and one of the leading institutions of its kind. He later set up similar studios in Berlin, Leipzig, Brunswick, Stuttgart and Munich, to conducting which he devoted most of his time. Among his best works are a collection, 112 engravings, after drawings by Rudolf Elster; illustrations for several works, including Immermann's ‹Der Oberhof› and Count Waldersee's ‹Der Jäger›; ‹The Odyssey,› after drawings by Preller and eight frescoes in the Rathhaus at Aix-la-Chapelle.

BRENDAN, or **BRENAINN, Saint,** of Clonfert: b. 484 at what is now Tralee in Kerry; d. 577. He was educated under his relative, Bishop Erc, and Saint Jarlath of Tuam, and was ordained by the former. Shortly afterward he went on a seven years' voyage in search of «the mysterious land far from human ken»; but without definite result. Later he visited and lived in Brittany for a time, and after his return he again set out to seek the distant paradise, which he ultimately found. When he again reached Ireland he founded the monastery of Cluain Fearta (Clonfert), and he seems to have visited the Western Isles of Scotland at this time. His two voyages form the basis of the celebrated mediæval legend of the ‹Navigation of Saint Brendan›; but in the legend they are united into one and combined with other stories. Where Brendan's voyages really led him to we do not know. The ‹Book of Lismore› contains a life of Saint Brendan. Consult O'Donoghue, ‹Brendaniana› (Dublin 1893), and Schröder, B. C., ‹Sanct Brendan› (Erlangen 1871).

Another Irish saint of the same name was born about 490 and died in 573. He was a friend of Columba, and founded a monastery at Birr (Parsonstown) in King's County.

BRENDEL, brĕn'dĕl, **Heinrich Albert,** German painter: b. Berlin, 7 June 1827; d. 1895. He studied at the Berlin Art Academy under Krause, and in Paris as a pupil of Couture and Palizzi. After traveling in Italy and Sicily, he lived in Paris, 1854–64; he then returned to Germany and lived in Berlin and Weimar, becoming director of the art school at the latter place. He devoted himself almost entirely to animal painting, and his pictures of sheep are considered especially fine. His works include ‹Peasant's Farm,› ‹Interior of Sheep Stable,› ‹Sheep Leaving Stable.›

BRENDEL, Karl Franz, German musical author, editor and critic: b. Stolberg-am-Harz, Prussia, 1811; d. 1868. He studied at the universities of Leipzig and Berlin; lectured on the history of music in Freiberg and Dresden; in 1844 became instructor in musical history and æsthetics at the Conservatory of Leipzig, and at the same time editor of the *Zeitschrift für Musik,* founded by Schumann in 1834. Early favoring the reform movement originated by Wagner and Liszt, when they, he and others in 1861 founded the ‹Allgemeiner Deutsche Musikverein,› he made the *Zeitschrift* the organ of reconciliation for the contending factions. Until his death he was president of the Society, and published a second periodical, *Anregungen für Kunst, Leben und Wissenschaft.* He also wrote ‹Grundzüge der Geschichte der Musik› (1848); ‹Geschichte der Musik in Deutschland, Italien und Frankreich› (1852); ‹Die Musik der Gegenwart und die Gesamtkunst der Zukunft› (1854).

BRENEMAN, Abram Adam, American chemist: b. Lancaster, Pa., 28 April 1847. He was graduated at Pennsylvania State College in 1866, and after service as an instructor was full professor of chemistry 1869–72. From 1875 to 1882 he was assistant, lecturer and professor of industrial chemistry at Cornell. Since then he has resided in New York, engaged in professional work as a writer, analyst and chemical expert. He is the inventor of the Breneman process of rendering iron non-corrosive and has made a special study of water and its contaminations. He edited the *Journal of the American Chemical Society* in 1884–93, and served as expert member of the municipal explosives commission of New York city in 1906–09. He has written ‹Manual of Introductory Laboratory Practice› (1875); ‹Report on the Fixation of Atmospheric Nitrogen› (1890), and numerous contributions to chemical and other journals.

BRENET, brĕ-nā', **Michel,** properly **BOBILLIER, Marie,** French musical historian and author: b. Lunéville, 12 April 1858. A valued contributor to several leading musical periodicals, also to the *Grande Encyclopédie* and the *Rivista musicale italiana,* she resided for some time at Metz and at Strassburg, settling in Paris in 1871. Her writings show evidence of much original, independent and erudite research; her published works include ‹Histoire de la Symphonie à orchestre jusqu'à Beethoven› (1882); ‹Grétry, sa vie et ses œuvres› (1884); ‹Jean d'Okeghem› (1893); ‹Claude Gondimel› (1898); ‹Notes sur l'histoire du luth en France› (1899); ‹La jeunesse de Rameau› (1903); ‹Palestrina› (1906);

‹La plus ancienne méthode française de musique› (1907).

BRENHAM, Tex., city and county-seat of Washington County, on the Gulf, Colorado and Santa Fé and the Houston and Texas Central railroads, 72 miles northwest of Houston. It is the centre of an agricultural and cotton region and has two cotton compresses, a cotton factory and a cottonseed-oil mill, machine shops, a creamery, ice factory, as well as other manufacturing interests. It is the seat of the Blinn Memorial and Evangelical Lutheran colleges, Sacred Heart Convent and the Normal and Industrial College for Negroes; has a library, two parks and fair grounds. It was settled in 1845, was incorporated in 1866 and its government is vested in a mayor, elected for two years, and a city council. Pop. (1920) 5,066.

BRENKENHOF, brĕn′ken-hof, **Friedrich Balthasar Schönberg von,** Prussian military organizer and administrator: b. Reideburg, near Halle, 1723; d. 1780. He received the appointment of equerry to Prince Leopold of Anhalt-Dessau and achieved great reputation with the authorities during the Seven Years' War by his secret and rapid system of commissariat and supplies, notably cavalry, which allowed Frederick the Great to make his swift marches and unexpected attacks. He entered the Prussian service and was appointed to administer the devastated eastern provinces. Settlements were founded, cities rebuilt, industries fostered, roads and canals constructed and he satisfactorily restored order and prosperity. His estates were confiscated at his death owing to irregularities in his accounts, but later were restored to his family. Consult Meissner, ‹Leben Brenkenhofs› (Leipzig 1782).

BRENNAN, Louis, Australian inventor: b. Ireland 1852. Having emigrated to Australia in boyhood, he was apprenticed to a civil engineer at Melbourne and here the future torpedo of England's navy was first conceived in the mind of its inventor when he was but 22. Thirteen years later, in 1887, the government, by the advice of the admiralty, bought the invention for $550,000. A more recent triumph of Mr. Brennan is an adaptation of the gyroscope to the monorail—a device which he demonstrated before the Royal Society in 1907, and which secured the highest award of the Japan-British Exhibition of 1910.

BRENNER, Victor David, American medalist and sculptor: b. Shavly, Russia, of American parents, 12 June 1871. In 1890 he came to the United States and worked for several years as a die-cutter. He went to Paris in 1898, studied under Roty and was awarded prizes for his exhibits at the Paris Exposition and Salon of 1900. He also received awards for his work at the Pan-American Exposition in Buffalo in 1901 and at the Louisiana Purchase Exposition in Saint Louis in 1904. The Paris Luxembourg, the Munich Glyptothek and the New York Metropolitan Museum contain examples of his work. His portrait medals of Theodore Roosevelt, Whistler, Carl Schurz, Collis P. Huntington and W. M. Evarts are well known by illustrated reproductions; he designed the Lincoln cent, and among other work the seal of the Fine Arts Federation of New York and of the New York Public Library. Representative of his sculpture is the bust of Charles Eliot Norton in the Fogg Museum, Harvard University.

BRENNER PASS, a mountain pass in the Austrian Tyrol on the route between Bozen and Innsbruck. It is the lowest pass over the main ranges of the Alps. The summit, 25 miles south of Innsbruck, is 4,470 feet above the sea and on the line dividing the watersheds of the Black and Adriatic seas. This pass was used by the Romans; in 1772 it was made available for carriages and in 1867 a railway was opened. This railway passes over 67 bridges and through 22 tunnels, the longest of the latter being 2,800 feet long. This line links up the Austrian and Italian railway systems and is the quickest route from central Germany to Italy. It was projected by Austria at a time when she controlled Venetia in order to make Venice the port of South Germany and also as an aid in military operations. Despite the political changes of the 19th century hereabout the railway has been of ever increasing importance as a factor in the commercial relations of Austria, Germany and Italy. The village of Brenner near the summit gives its name to the pass. Consult Riehl, ‹Die Kunst an der Brennerstrasse› (Leipzig 1908) and Wanka von Rodlow, ‹Die Brennerstrasse› (Prague 1900).

BRENNUS, the name or title of several princes of the ancient Gauls, supposed to be derived from the Kymrian *brenhin,* a king. A leader of the Senones, a Gallic nation in the upper part of Italy, the most famous personage who is mentioned under this name made an invasion into the Roman territory about the year 390 B.C. A battle was fought near the river Allia, the Romans were totally defeated and Brennus took possession of the city, which had been previously abandoned by the inhabitants. The capitol only was provided with a garrison, but several aged citizens of rank, amounting in the whole to about 80, had resolved to remain in the city and devote themselves to the infernal deities. Attired in their sacerdotal, consular and triumphal robes, they seated themselves in their chairs of office in the middle of the forum, awaiting death. When Brennus arrived at the forum, he was struck with astonishment at their venerable aspect. The Gauls looked upon them as so many statues of deities and feared to go near them, but ultimately they were all massacred. Rome was sacked and all the inhabitants who yet remained in their houses were slain. Brennus then assaulted the capitol and being repelled with considerable loss, he set fire to the city and leveled it to the ground. While the garrison of the capitol was in great distress Brennus attempted a surprise by night, in which he would have succeeded had not the cackling of the geese, sacred to Juno, alarmed the garrison, in consequence of which the Gauls were repulsed. After six months Brennus offered to raise the siege and leave the Roman territory for 1,000 pounds of gold. When the gold was weighed, Brennus threw his sword into the scale beside the weights and cried out, «Woe to the vanquished!» According to Polybius the Gauls returned home in safety with their booty. According to the Roman legend followed by Livy, Brennus was defeated and his army entirely destroyed by Camillus, a distinguished Roman exile who had retired to the city of Ardea and who arrived with succor in time to save the capitol. Another Brennus in 279 B.C. advanced into Greece with an enormous force, said to have amounted to 150,000 foot and 61,000 horse. After ravaging Macedonia he entered Thessaly and marched toward Thermopylæ, where an army of 20,000 Greeks was assembled, supported by an Athenian fleet on the coast. The Gauls were repulsed in a sanguinary battle, but, in order to separate the Greeks, they dispersed themselves to plunder the country. Brennus himself attacked the temple of Delphi, which was defended by only 4,000 men, but was again repulsed and carried out of the battle fainting with his wounds. Unwilling to survive his defeat, he put an end to his life by copious draughts of wine. The Greeks attributed their victory to the assistance of Apollo.

BRENT, Charles Henry, American clergyman: b. Newcastle, Ontario, 9 April 1862. He received the degree of B.A. at the University of Trinity College, Toronto (with classical honors) 1884; M.A. 1889; D.D. 1901; D.D. King's College 1910; D.D. Harvard University 1913; was made deacon 1886; priest 1887; was assistant minister at Saint Paul's Cathedral, Buffalo, 1887; at Saint John the Evangelist, Boston, 1888–91; associate rector of Saint Stephen's, Boston, 1891–1901. He was elected bishop of the Philippine Islands by the Protestant Episcopal general convention, 1901. He was on the editorial staff of *The Churchman,* New York, 1897–1900; member of Philippine opium investigating committee, 1903–04; Paddock lecturer, General Theological Seminary, New York, 1904; William Belden Noble lecturer at Harvard University, 1907. He declined the bishopric of Washington in 1908. He was chief commissioner of the United States and president of the International Opium Commission, 1908–09; chairman of the United States delegation to the International Opium Conference at The Hague, and president of the conference 1911–12; was elected bishop of New Jersey in 1914 and declined. Author of ‹With God in the World› (1899); ‹The Consolations of the Cross› (1902); ‹The Splendor of the Human Body› (1904); ‹Adventure for God› (1904); ‹Liberty and Other Sermons› (1906); ‹With God in Prayer› (1907); ‹The Mind of Christ› (1908); ‹Leadership› (1908); ‹The Sixth Sense› (1914); ‹Presence› (1911); ‹The Revelation of Discovery› (1908); ‹Prisoners of Hope› (1915); ‹The Inspiration of Responsibility›; ‹A Master Builder (Life and Letters of Bishop Satterlee)›; ‹The Conquest of Trouble.›

BRENT, Richard, American politician: b. Virginia; d. Washington, D. C., 30 Dec. 1814. He was a representative in Congress from 7 Dec. 1795 till 3 March 1799, and again from 7 Dec. 1801 till 3 March 1803. He was elected a senator from Virginia and served from 22 May 1809 until his death.

BRENT GOOSE. See BRANT.

BRENTA (ancient MEDOACUS MAJOR), a river in North Italy. Its source is Lake Caldonazzo in the Trentino, Italy, eight miles southeast of Trent, whence it flows southeast through the Sugana Valley, then south through Venetia, with a winding course of 106 miles, and falls into the Adriatic through the canal of Brenta-nova or Brentono, at Brondolo. Formerly its embouchure was at Fusina, opposite Venice. The old course has been formed into a canal and is the chief means of communication between Padua and Venice, the new channel being comparatively little used. It is navigable for 56 miles.

BRENTANO, brĕn-tä'nō, **Clemens,** German poet: b. Ehrenbreitstein, 8 Sept. 1778; d. Aschaffenburg, 28 July 1842. He studied at Jena, and resided by turns there and at Frankfort, Heidelberg, Vienna and Berlin. In 1818 he joined the Catholic church and retired to the convent of Dülmen, in Münster, and the latter years of his life were spent at Ratisbon, Munich and Frankfort-on-the-Main. These frequent changes were due to a restless disposition, combined with morbid and misanthropic views, which gave a peculiar character to his writings. Toward the end of his life he showed plain traces of mental derangement. With a powerful imagination, his genius was tinged with mysticism, eccentricity, and a strong tendency to sarcasm. He was the brother of Elizabeth von Arnim, Goethe's «Bettina.» Among his principal works are ‹Satires and Poetical Fancies› (1800); ‹The Mother's Statue› (1801), an ultra-romantic production, which he himself calls a very wild romance; ‹The Joyous Musicians› (1803); ‹Ponce de Leon› (1804); ‹The Founding of Prague› (1816), said to be his most successful drama, and overflowing with humor; ‹Gokel, Hinkel und Gakeleia› (1838), a satire on the times; ‹History of the Brave Caspar and the Beautiful Annerl› (2d ed., 1851), esteemed as a novelette masterpiece.

BRENTANO, Franz, German philosopher: b. Marienberg, 16 Jan. 1838. He was professor of philosophy at Würzburg, but in 1873 resigned his position on account of the doctrine of the infallibility of the Pope; and was professor at Vienna, 1874–80. He has written ‹Psychology of Aristotle,› ‹New Riddles›. and ‹Psychology from an Empirical Standpoint› (in agreement with Lotze and the English empirical psychologists); ‹Neue Rätsel› (1878); ‹Vom Ursprung Sittlicher Erkenntniss› (1889, English trans., 1902); ‹Untersuchungen zur Sinnespsychologie› (1907); ‹Aristoteles und seine Weltanschauung› (1911); ‹Aristoteles Lehre vom Ursprung des menschlichen Geistes› (1911); ‹Von der Klassification der Psychischen Phänomene› (1911).

BRENTANO, Lorenz, German-American politician: b. Mannheim, 4 Nov. 1813; d. Chicago, 18 Sept. 1891. He studied law at Heidelberg, represented Mannheim in the Lower House of Baden, and was a member of the National Assembly in 1848. He withdrew from this body with the majority of the Radical party in 1849. He was placed at the head of the revolutionary government of Baden, but suspected of treachery to his party, was forced to flee to Switzerland. In 1850 he came to the United States, lived for a time on a farm in Michigan, and then went to Chicago. Here he practised law and established the Illinois

Staatszeitung, which he made one of the most influential papers in the Northwest in the interest of the Federal government, and which rendered great service during the Civil War. He was a member of the Illinois legislature in 1862; United States consul at Dresden 1872–76, and member of Congress from Illinois in 1876.

BRENTANO, Lujo, German political economist: b. Aschaffenburg, Bavaria, 18 Dec. 1844. He studied at Dublin and at four German universities, and, after attaining a post in the Royal Statistical Seminary in Berlin, went, with Ernst Engel, to England to study the condition of the working classes and especially trades' associations and unions. The outcome of this was his work ‹On the History and Development of English Guilds› (1870); ‹Die Arbeitergilden der Gegenwart› (1871–72). He has been professor at Breslau (1873), Strassburg, Vienna, Leipzig, Munich (1891). He supports the «Socialists of the Chair» (*Kathedersozialisten*) against the German free-trade school, and has written works on ‹Wages› (1877); ‹Labor in Relation to Land› (1877); ‹Compulsory Insurance for Workmen› (1881); ‹Agrarpolitik› (1897); ‹Erbrechtspolitik› (1899); ‹Die Schrecken der überwiegende Industriestaat› (1901); ‹Die Entwickelung der Wertlehre› (1908); ‹Die deutsche Getreidezölle› (1911).

BRENTFORD, England, the county town of Middlesex, seven miles west of London. It has a weekly market and two annual fairs. Here Edmund Ironside defeated the Danes under Canute in 1016, and Prince Rupert a part of the Parliamentary forces under Colonel Hollis in 1642. Sion House, the magnificent edifice of the Duke of Somerset, where Lady Jane Grey resided, now belonging to the Duke of Northumberland, was built south of Brentford on the site of a suppressed nunnery. Brentford has malt-kilns, a soap manufactory and extensive sawing and planing mills. Pop. 16,571.

BRENTON, William, colonial governor: b. England, early in the 17th century; d. Newport, R. I., 1674. His family came to Massachusetts in 1634 from Hammersmith, England, but removed to Portsmouth, R. I., five years later. He was one of the nine original proprietaries of Rhode Island; he selected and surveyed the site of Newport and built a large brick residence where Fort Adams now stands. Brenton's Point and Brenton's Reef in Narragansett Bay preserve his name. Between 1635 and 1669 Brenton was the colony's representative at Boston, lieutenant-governor, president of the colony and governor under the Charles II charter 1666–69. Consult ‹Rhode Island Colonial Records,› Vols. I and II, *passim.*

BRENZ, Johann, yō'hän brĕnts, German reformer: b. 1499; d. 1570. Under the influence of Luther he reorganized his church at Hall, Swabia, but at the time of the Smalkaldic War in 1546 he was obliged to flee to Württemberg. He was appointed minister of the Collegiate Church of Stuttgart in 1553 and is said to have been the first exponent of the Reformation there. He was one of the authors of the *Syngramma Suevicum,* bearing upon the controversy with Zwingli and Œcolampadius on the subject of the Lord's Supper. One of his teachings was that the body of the Lord is everywhere present, hence his followers were called Ubiquitarians. He was the most resolute among the opponents of the killing of Anabaptists and other heretics who did not belong to his party. His works appeared in eight volumes at Tübingen (1576–90). Consult his life by Hartmann and Jüger (2 vols., Hamburg 1840–42), and Köhler, ‹Bibliographia Brentiana› (Berlin 1902).

BRERETON, Austin, English journalist: b. Liverpool, England, 13 July 1862. He went to London in 1881, was dramatic critic of *The Sphere* from 1901–06; and prior to that time was connected with *The Stage, The Theatre,* Sydney (N. S. W.) *Morning Herald* and the *Illustrated American* (New York). He has published a large number of works, chiefly about famous players and theatrical history.

BRESCIA, brĕ'shạ (Latin, *Brixia*), Italy, an episcopal city of Lombardy. It is situated at the foot of the Alps, 40 miles northwest of Verona, on a fertile and beautiful plain on the banks of the rivers Mella and Garza. It is the capital of the province of the same name and is a handsome and flourishing city, of a square form, about four miles in circuit, and surrounded by walls. Its streets are spacious and its public buildings numerous, particularly its churches, which are further remarkable for the number and value of the paintings with which they are enriched. A few of them only, however, have much pretension to architectural beauty; among those that have are the cathedral, a handsome structure of white marble, and the church of San Domenico. But, however plain in exterior appearance most of the Brescian churches may be, they are all richly decorated within with the most beautiful frescoes and other creations of taste and art. The other buildings most worthy of notice are the Palazzo della Logia and the Broletto. The first was intended for the palace of the municipality or city hall. It is composed of the richest marbles and was worked upon by the first architects of the 15th and 16th centuries successively. The Broletto, the ancient palace of the republic, combines the characters of fortress and city hall, and is surmounted by a great tower, whose deeply cleft Italian battlements produce a singularly grand effect. The whole is in a colossal style and marked by the peculiar characteristics of the age in which it rose — supposed to be about the end of the 12th and beginning of the 13th century. The city contains also a lyceum, two gymnasia, an athenæum, a college, with a museum of antiquities, and a botanic garden; a public library, with 30,000 volumes; a theological seminary, a handsome theatre, a corn exchange, an extensive hospital and other educational and charitable establishments. There are 72 public fountains in the streets and squares, besides some hundreds of private ones. Outside the town is a cemetery, begun in 1815, designed by Vantini.

Brescia is a place of considerable trade and manufacturing industry. Near it are large ironworks and its firearms are esteemed the best that are made in Italy. It has also silk, linen and paper factories, tan-yards and oil-mills, and is an important mart for raw silk. But it derives its greatest interest from its fine Roman remains, having been at one time the seat of a Roman colony. These first attracted attention in the 17th century, although, so far as regards inscriptions, they had been objects of especial care to the citizens of Brescia for two centuries before this period, but it was not till 1820 that any very earnest efforts were made to bring the buried remains of entire buildings to light. Since that period some remarkable discoveries have been made, embracing, besides numerous statues and inscriptions, the beautiful marble temple of Vespasian and a number of noble and magnificent Corinthian columns, with many fragments of moldings and ornaments, some gilt and all of great elegance. Brescia was the seat of a school of painting of great merit, to which many eminent artists belonged, including Alessandro Bonvicino, commonly called «Il Moretto,» who flourished in the 16th century and was remarkable for the deep devotional feeling which he threw into his sacred subjects, as well as for his excellence as a portrait painter. The city is of great antiquity, having been the chief town of the Cenomani, a Gallic tribe, who were conquered by the Romans. It became the seat of a Roman colony under Augustus about 15 B.C., and afterward a municipium. In the year 412 it was burned by the Goths and was soon afterward destroyed by Attila, but was rebuilt about the year 452. It was taken by Charlemagne in 774. In 936 Otho I of Saxony declared it a free city, and it so remained for nearly three centuries, taking an active part in the feuds of the Guelphs and Ghibellines, and ultimately put itself under the protection of Venice in 1426. In 1796 it was taken by the French and was assigned to Austria by the general treaty signed at Vienna 9 June 1815. In 1849 it was involved in the commotions of continental Europe; its streets were barricaded but the city was eventually captured by the Austrians under General Haynau. It was ceded to Sardinia by the Treaty of Zürich in 1859, and in 1860, with the remainder of Lombardy, it was added to the kingdom of Italy. Pop. 83,338.

BRESHKOVSKAYA, Ekaterina Constantinovna, Russian revolutionist: b. 1843. The daughter of well-to-do parents, she was brought up and educated in the country. She early evinced a deep sympathy with the poor and illiterate peasants around her, dispensing charity and teaching them to read. As a young girl she was married to a nobleman of similar liberal disposition to herself, by whom she had a son. According to her own statement, she came to Saint Petersburg, Moscow and Kieff at the age of 25 and became an active member of the revolutionary party. She left her husband and child to devote her life to «preach the gospel of liberty.» At 29 she was arrested and sentenced to 22 years' imprisonment in Siberia, whither she was sent after spending four years in various prisons. She returned to Russia in 1896 and started a society called the Socialist Revolutionists. For the next 11 years she traveled over the empire spreading revolutionary doctrines. In 1904 she visited America. On her return she was again arrested and exiled to Siberia. The successful revolution of 1917 opened the prison doors for thousands of political prisoners and Breshkovskaya was recalled from Siberia with many others. She was welcomed to Petrograd with great public enthusiasm and almost royal honors. Her first task was to establish printing presses in populous centres of Russia for further propaganda among the peasants. She fervently exhorted her compatriots to steadfastly continue the war, and desired even to go to the front in order to talk to the troops «who are so dark in their minds that they think this is a war for the Tsar and the capitalists.» See RUSSIA, REVOLUTION. Consult Blackwell, Alice S., 'The Grandmother of the Russian Revolution' (New York 1917); the *Outlook* (21 Nov. 1917).

BRESLAU, brĕs'low, Germany, city ranking third after Berlin and Cologne in population; capital of the province of Silesia. It is situated in a spacious plain at the confluence of the Ohlau and the Oder, the latter dividing it into two main portions (the largest on the left bank), which, with islands in the river, are connected by a large number of bridges. The streets of the older quarters are narrow, those of the newer broad, connected by electric and other street railroads. The public squares and buildings are handsome. The fortifications which surrounded the old or inner city were converted into pleasant promenades and the ditch into an ornamental sheet of water. The cathedral, built in 1148–1680 and restored in 1875; the Protestant churches of Saint Elizabeth (13th century), Saint Mary Magdalene (14th century), Saint Michael (19th century); the synagogue; the Rathhaus or city hall, a Gothic structure of the 14th and 15th centuries; the municipal buildings; the government buildings; the building for the provincial Diet; the royal residence, courthouses, exchange and university are among the most remarkable buildings. The university was founded in 1702 as a Roman Catholic institution, with which was combined the Protestant university at Frankfort-on-the-Oder, transferred hither in 1811. The university has attached to it a museum of natural history, a cabinet of antiquities, a library of several hundred thousand volumes, including many old works and manuscripts, an observatory, a picture gallery, a botanic garden, etc. The number of students is about 1,500. There are numerous other educational institutions, as well as hospitals and asylums. Gas, electric lighting and power plants, and modern waterworks are operated by the municipality, which also built an up-to-date system of sewers with sewage farms. Breslau carries on an extensive trade in the products and manufactures of Silesia, principally in corn, wool, metals, glass, coal and timber. The Oder is navigable and there is a connection with Berlin by the Oder-Spree Canal. The industries comprise iron-founding, bell-founding, the manufacture of machinery, railway carriages, organs and other musical instruments, cigars, oil, spirits, etc., brewing and glass-painting. There are two annual wool fairs which are largely attended. Breslau was the seat of a bishopric by the year 1000, an independent duchy from 1163 to 1335, was ceded to Austria, after many wars and calamities, in 1527. It was conquered by Frederick II of Prussia in 1741. It was from this time the scene of frequent warfare, being successively attacked by Austrians, French, Russians and Prussians. It was twice occupied by the French, in 1807 and 1813. Its fortifications were destroyed by Napoleon in 1807, but it finally remained in the hands of Prussia. Pop. 514,000.

BRESSANI, brĕs-sä'nẹ, **Francesco Giuseppe,** Italian missionary: b. Rome, 6 May 1612; d. Florence, 9 Sept. 1672. He became a novitiate of the Jesuit order in 1626, in 1642 ministered to the French settlers in Quebec and in 1643 was missionary to the Algonquins at Three Rivers. In 1644 he was captured by the Iroquois while on his way to the Huron mission, cruelly tortured by them and was ransomed by the Dutch at Fort Orange. On his return from France he joined the Huron mission, and, after its destruction, accompanied (1649) the Huron refugees to Saint Joseph Island. In 1650, his health being indifferent, he returned to Europe. He is the author of 'Relazione dei missionari della compagnia de Gesú nella Nuova-Francia' (1653), of which an English edition appears in Thwaite's edition of the 'Jesuit Relations.'

BRESSAY, brĕs'sā, one of the Shetland Islands, lying east of the mainland and separated from it by Bressay Sound, about six miles long and one to three in breadth. Its line of coast is rocky and deeply indented; the interior is hilly, rising in the Wart of Bressay to 742 feet, and is to a great extent covered with peat-moss. There are slate and stone quarries. On the south there are three bold headlands, the Ord, the Bard and the Hammar. Hosiery is the only manufacture. Bressay Sound forms a safe harbor, one mile or more in breadth, having Lerwick on its west side. Pop. about 1,000.

BRESSLAU, Harry, German historian: b. Dannenberg, Hanover, 1848. He was educated at the universities of Berlin and Göttingen, and in 1870 became professor at the Realschule of the Jewish congregation in Frankfort-on-Main. In 1872 he was transferred to the Andreas Realschule at Berlin, becoming at the same time private lecturer at the University of Berlin and in 1877 extraordinary professor at the latter institution. In 1888 he was nominated to the directorate of the Monumenta Germaniæ Historica and from 1888 to 1903 was editor of the *Neues Archiv der Gesellschaft für ältere deutsche Geschichtskunde.* In 1890 he became professor of history at Strassburg and was rector of the university there in 1904–05. His publications include 'Diplomata Centum' (1872); 'Jahrbücher des deutschen Reichs unter Kaiser Heinrich II' (Vol. III, 1875); 'Jahrbücher des deutschen Reichs unter Konrad II' (2 vols., 1879–84); 'Zur Judenfrage, Sendschreiben an Heinrich von Treitschke' (2d ed., 1880); 'Handbuch der Urkundenlehre' (2d ed., 1912); 'Das Tausendjährige Jubiläum der deutschen Selbständigkeit' (1912).

BREST, France, a fortified seaport and naval station, in the department of Finistèrre, in the former province of Brittany, situated at the mouth of the Penfeld, 320 miles south by west from Paris. It has one of the best harbors in France and a safe roadstead, capable of containing 500 men-of-war in 8, 10 and 15 fathoms at low water, and it is the chief station of the French marine. The coast on both sides is well fortified. The entrance to the roads, known as Le Goulet, is narrow and difficult, with covered rocks that make it dangerous to those not well acquainted with it. There are immense magazines, workshops, barracks, roperies, etc., and the dockyard employs from 8,000 to 9,000 men. Several docks are cut in the solid rock. It is fully equipped with floating and graving docks, quays, piers and a breakwater. Brest, which in the Middle Ages was of so much importance that it was said "He is not Duke of Brittany who is not lord of Brest," had sunk by the beginning of the reign of Louis XIII to little more than a village. Richelieu resolved to make it the seat of a vast naval arsenal, but little was done till the beginning of the reign of Louis XIV, when Duquesne came to superintend the works. Vauban followed him and fortified it. In 1694 the combined fleets of England and Holland disembarked a force which attempted to take Brest, but was repulsed with great loss. On 1 June 1794 the French fleet was beaten off Brest by the British under Howe, who took from them six ships of the line and sunk a seventh. Brest has naval schools, a naval library, several hospitals, a free library, lyceum and botanical gardens. The trade in wine, coal, timber, flour, fruit and vegetables is very large. It has also mills and foundries, chemical factories, boot and shoe manufactories and linen factories. There is a submarine cable to the United States. Pop. 90,540.

BREST-LITOVSK, brĕst-le-tōfs'k, Russia, a fortified town in the government of Grodno, on the Bug, 120 miles east of Warsaw. Brest-Litovsk was a possession of Poland till 1795 and is one of the oldest Slav towns. At church congresses here in 1590, 1594 and 1596, the union of the Eastern and Western churches, under the supremacy of the Pope, was proclaimed. The place is an important railroad centre and of considerable importance because of its situation, and has a large trade in cloths, leather and soap. It is a fortress of the first rank, with vast magazines and military stores. It was taken by the German armies under Von Hindenburg and 26 Aug. 1915, after a stubborn resistance of many months. The town was the meeting place of the German and Bolshevik envoys in the fall of 1917 and here was signed the peace treaty between the two countries. See WAR, EUROPEAN — EASTERN FRONT. Pop. about 50,000.

BRETAGNE. See BRITTANY.

BRETEUIL, brĕ-tė-y', **Louis Charles Auguste le Tonnelier** (BARON DE), French diplomatist: b. 1730; d. 2 Nov. 1807. After a period of military service he became, in 1758, Minister Plenipotentiary at Copenhagen and afterward occupied similar posts in Sweden, Austria, Naples and again in Vienna. His embassy to Vienna explains his attachment to the Queen Marie Antoinette. As minister and Secretary of State after Necker's dismissal in 1789, he was a zealous defender of the monarchy; he was therefore considered as one of the greatest enemies of the Revolution. After the capture of the Bastile he escaped to Switzerland. In 1790 Louis XVI entrusted him with secret negotiations for his restoration to the throne, at the principal northern courts. The convention issued a decree against him. In 1802 he returned, with the permission of the government, to France.

BRETHREN, Bohemian, a Christian sect of Bohemia, formed from the remains of the stricter sort of Hussites in the latter half of the 15th century. They took the Scriptures as the ground of their doctrines throughout. Being persecuted, they fled into Poland and Prussia. See BOHEMIAN BRETHREN; MORAVIAN CHURCH; UNITED BRETHREN.

BRETHREN, Plymouth. See PLYMOUTH BRETHREN.

BRETHREN OF THE COMMON LIFE, a mediæval semi-monastic order founded by Gerard Groot of Deventer (1340–84), a deacon, as an intermediate stage between monasticism, which he considered the highest life, and the life of the people. He established at Deventer and elsewhere communities wherein men, or in some cases women, might live together piously and perform good works. These brotherhoods and sisterhoods had no formal vows but, like strictly monastic communities, lived without private property and devoted themselves to the care of the poor and sick, to the copying of books and to teaching. They wore special black and gray garments, and lived according to a strict discipline. At first they met with strong opposition on the part of the established monastic orders. They seem to have held no peculiar doctrines, except in so far as they maintained that translations of the Bible should be put into the hands of laymen. Their educational labors were not carried on by special schools founded by the order, and the schools in which they taught in time fell into the hands of the Jesuits. The order founded several reformed monasteries, among which were the Augustinian foundation at Windesheim and that at Mount Agnes, near Zwolle, where Thomas à Kempis (q.v.) was a monk. During the Reformation some Brother-houses, such as that at Wesel, went over to Lutheranism. Consult Cruise, Sir Francis, ‹Thomas à Kempis: a Visit to the Scenes in which His Life Was Spent› (London 1887); Gem, S. H., ‹Hidden Saints: the Brethren of the Common Life› (London 1907); Grube, K., ‹Groot und seine Stiftungen› (Cologne 1883); Kettlewell, ‹Thomas à Kempis and the Brethren of the Common Life› (London 1885).

BRETHREN OF THE FREE SPIRIT, a sect which sprang up on the upper Rhine near the beginning of the 13th century. They are frequently confounded with the Lollards, Beghards or Beguins. They held that the universe was a divine emanation; that man, so far as he gave himself to the contemplative life, was a Christ and, as such, free from law, human or divine (Romans viii, 2, 14). Many edicts were published against this sect, but it continued to exist under various names, such as Picards and Adamites, till about the first quarter of the 15th century.

BRETHREN OF THE HOLY TRINITY, a religious society, founded in France near the close of the 12th century, whose members pledged themselves to give a third part of their revenues to procuring the redemption of Christians who had fallen captive to the infidels and were in Mohammedan slavery. It was established by John of Matha, a Parisian theologian, and Felix de Valois.

BRETHREN OF THE LORD, The. Great controversy has existed concerning the expressions in the New Testament relating to the «brethren of Jesus,» and theologians have been divided on the question of the perpetual virginity of Mary, the mother of Jesus. The term «brethren of the Lord» occurs but once in the New Testament (1 Cor. ix, 5), but there are several other passages that refer apparently to actual brothers of Jesus (Gal. i, 19; Matt. xii, 46–50, etc.). Some have claimed that the brethren referred to were later sons of Mary by Joseph, the reputed father of Jesus; others have contended that they were sons of Joseph by a former marriage, and others again have sought to prove that these brethren were sons of Alphæus, the husband of a sister of Mary, and therefore the cousins of Jesus.

BRETHREN, RIVER. See RIVER BRETHREN.

BRETHREN OF THE STRICT OBSERVANCE, the stricter Franciscans, or Regular Observatines.

BRETIGNY, brĕ-tēn-yē, France, village in the department of Eure-et-Loire, six miles southeast of Chârtres, on the Paris & Orleans Railroad. By the treaty of Bretigny, concluded on 8 May 1360 between Edward III of England and John II of France, the latter, who had been taken prisoner at the battle of Poitiers, recovered his liberty on a ransom of 3,000,000 crowns (about $8,000,000), to be paid in six years. Edward renounced his claim to the crown of France and relinquished a portion of his conquests and possessions in that country, including Anjou and Maine and the greater part of Normandy, receiving the cession in independent sovereignty of the duchy of Aquitaine, with all its dependencies, Gascony, Poitou, Saintonge, Aunis, Agenois, Périgord, Limousin, Quercy, Rouergue, Angoumois, together with Calais, the counties of Ponthieu and Guines and the viscounty of Montreuil. Consult Lavisse, ‹Histoire de France› (1902).

BRETON, Jules Adolphe, French painter: b. Courrières, Pas de Calais, 1 May 1827; d. Paris, 5 July 1906. He was educated at Saint Omer and at Douai, and studied under Félix Devigne and at Drölling's atelier in Paris. The subjects of his earlier pictures, such as ‹Misère de Désespoir› (1849), were taken from the French revolutionary period, but he soon turned to the scenes from peasant life which he has treated in a most poetic and suggestive manner, with an admirable union of style with realism. He has been likened to Millet in the depiction of the life of the fields. In 1853 he exhibited the ‹Return of the Harvesters› at the Salon; and this notable painting was followed by the ‹Little Gleaner,› now in Brussels; ‹The Day After Saint Sebastian's Day› (1855); ‹Blessing the Fields› (1857); ‹The Return of the Gleaners› (1859, Luxembourg); ‹Women Mending Their Nets› (1876, Douai Museum); ‹A Gleaner› (1877, Luxembourg); ‹The First Communion› (1881), which brought $45,000 at the Morgan sale at New York in 1882; the ‹Pardon of Kergoat› (1891, Metropolitan Museum, New York). Breton has been a favorite with collectors in the United States; some 25 of his works are in this country, of which a notable example is the ‹Song of the

Lark' in the Art Institute of Chicago. He also attained to some celebrity in prose and poetry, and is the author of two books of autobiography — 'Life of an Artist' (1890); 'Un peintre paysan' (1895). He was elected a member of the Institute in 1886 and was made a commander of the Legion of Honor in 1889. Consult Vachon, 'Jules Breton' (Paris 1899).

BRETON, brā-tōn, **de los Herreros, Don Manuel,** Spanish dramatist: b. Quel, province of Logroño, 19 Dec. 1800; d. Madrid, 13 Nov. 1873. He was the most notable Spanish poet of the first half of the 19th century. He was a writer of amazing fecundity and gave to the Spanish stage 150 plays, some of them original, others derived from ancient Spanish sources or translated from French or Italian. In him the old French comedy finds not so much an imitator as its last true representative. He is irresistible in his handling of comic situations. Among his best original comedies are 'I'm Going Back to Madrid,' 'Here I am in Madrid,' 'This World is all a Farce,' 'Die Once and You'll See.' He was less successful in the historic drama than in comedy. He held at different times government appointments, but his liberal views led to supersessions.

BRETON LITERATURE. Breton forms with Cornish and Welsh the Cymric or southern division of the Celtic group of languages. For the purpose of freeing themselves from the Saxon domination, an emigration from Britain to Armorica (Brittany) took place in the 5th and 6th centuries of our era, and the tongue of the immigrants thus became the language of this part of France. The Breton language is still spoken by upward of a million people, chiefly in the departments of Finisterre and in the western portions of Côtes du Nord and Morbihan. It has numerous dialects — those of Vannes, Quimper, Tréguier and Léon being the chief. The last-named, as the literary medium, is the most important.

Old Breton literature from the 6th to the 14th centuries is closely identified with the work of the British bards. The material that has survived is lacking in diversity, being made up of miracle plays, a prayer-book and monastic cartularies. The language of the aristocracy of the province in the Middle Ages was French, and the Breton dialect accordingly sank to the level of a *patois.* Modern Breton — in which there is a great adhesion of French words — may be said to date from the publication, in 1659, of a manual with reformed spelling by Fabien Maunoir, a Jesuit priest. The beginning of the 19th century witnessed a marked revival in interest in the Breton language, due largely to the work of Legonidec, who, as an exile in Great Britain at the time of the French Revolution, fell under the influence of the Welsh literary movement. He published his 'Grammaire celto-breton' in 1807 and his 'Dictionnaire breton-français' in 1821. He had a successor in La Villemarqué, whose 'Barzaz Breiz,' while by no means a faithful rendering of the oral and floating folk-poetry of the province, and raising a storm of controversy almost as celebrated as that raised by the publication of Macpherson's 'Ossian,' acted as a stimulus to new investigators. F. M. Luzel (1821–95), the foremost of the Breton collectors of folk-lore, left for his contribution a series of books of great value. Marc' Larit Fulup, the last of the old-time wandering folk-singers of Brittany, died in 1910. Consult Loth, 'Chrestomathe bretonne' (1890); 'Vocabulaire vieux-breton' (1884); Ernault, 'Dictionnaire étymologique du moyen-breton' (1898); 'Glossaire moyen-breton' (2 vols., 1895–96); Luzel, 'Veillées bretonnes' (1879); 'Légendes chrétiennes de la basse-Bretagne' (1881); 'Contes populaires de la basse-Bretagne' (1887); Henry, 'Lexique étymologique du breton moderne' (1900); Le Goffic, 'L'âme bretonne' (Vols. I, II, 1908–12). See CELTIC LANGUAGES; CELTIC LITERATURES; GAELIC LITERATURE.

BRETONNE, Restif de la, Nicolas Edmé. See RESTIF DE LA BRETONNE, NICOLAS EDMÉ.

BRETS, BRETTYS or **BRITS,** Britons, the name given to the Welsh or ancient Britons in general; also to those of Strathclyde, as distinguished from the Scots and Picts.

BRETSCHNEIDER, brĕt'shnī-dėr, **Heinrich Gottfried von,** Austrian writer: b. Gera, 6 May 1739; d. 1 Nov. 1810. He was educated at the Institute of Herrnhuters at Ebersdorf, entered the army as a cornet, was present at the battle of Kolin, afterward became captain of a Prussian free-corps and was made prisoner by the French. During his forced stay in France he acquainted himself with the language and absorbed the spirit of the people. On his return he was appointed governor of Usingen in Nassau, afterward traveled in England and France, and was employed by Vergennes in diplomatic missions. He joined the service of Austria, and in 1778 became librarian to the University of Buda. Here his hostility to the monks, and especially to the Jesuits, got him into trouble, and that though the Emperor Joseph II, who held the same views, declared himself his protector. He was obliged to retire from Buda, and was appointed librarian at Lemberg. His views were liberal and somewhat sceptical, and, with his active opposition to the monastic orders, gained him many enemies. His principal works are 'Reise nach London und Paris' (1817); 'Almanach der Heiligen' (for the year 1788); 'Wallers Leben und Sitten' (1793).

BRETSCHNEIDER, Karl Gottlieb, German theologian: b. Gersdorf, Saxony, 11 Feb. 1776; d. Gotha, 22 Jan. 1848. He studied theology at Leipzig, was appointed pastor at Schneeberg in 1807, general superintendent at Gotha in 1816, and afterward councillor of the Upper Consistory there. Bretschneider established a reputation as a sound and judicious thinker on «rational supernaturalist» lines, who gave the first place to reason in the interpretation of dogma. In 1820 appeared his 'Probabilia de Evangelii et Epistolarum Johannis Apostoli Indole et Origine,' an attack upon the Johannine authorship from internal evidence; and in 1824 his 'Lexicon Manuale Græco-Latinum in Libros Novi Testamenti.' Another work of importance is his 'Handbuch der Dogmatik' (4th ed., 1838).

BRETTEN, town of Baden, Germany, the birthplace of Melanchthon on the Saalbach, 16 miles east-northeast of Karlsruhe by rail. The house in which Melanchthon was born belongs now to a foundation bearing his name for the support of poor students, established in 1861. A monument was erected in 1867. It has manufactures of japanned goods and machinery. Pop. 6,025.

BRETTS AND SCOTS, Laws of, the name given in the 13th century to a code of laws in use among the Celtic tribes in Scotland, the Scots being the Celts north of the Forth and Clyde, and the Bretts being the remains of the British inhabitants of the kingdom of Cambria, Cumbria or Strathclyde and Reged. Edward I issued in 1305 an ordinance abolishing the usages of the Scots and Bretts. Only a fragment of them has been preserved and has been printed in ‘Acts of the Parliament of Scotland’ (1844) in three languages, Latin, French and English. The French version is from a manuscript of 1270 and is the oldest; the manuscript is preserved in the register house in Edinburgh. The fragment thus published of the «laws of the Bretts and Scotts» is similar in character and probably of the same origin as the ancient laws of the Anglo-Saxon, Welsh, Irish and other principalities. They deal principally with and are aimed at crimes of violence. Minute and definite provisions are laid down as the penalties of such crimes and the terms on which they might be commuted. From the king down to the churl, the *cro* or price at which every man was valued according to is degree was fixed in the event of his being slain. This price had to be paid to his kindred by the slayer or his kindred. The *cro* of the king was valued at 1,000 cows; of the king's son or of an earl at 150 cows; of an earl's son or of a thane at 100 cows; of a thane's son at 66⅔ cows; of the nephew of a thane, or of an ogthiern, 44 cows and 21⅔ pence; and of a villein or churl, 16 cows. All persons of a lower degree than a thane's nephew, or an ogthiern, were accounted villeins or churls. The penalty or fine for a blow causing effusion of blood was fixed according to the degree of the person wounded and the place of the wound, in a chapter entitled «of blood-drawing,» which corresponds with the «blodwyte» of the Anglo-Saxons. See Avenger of Blood; Blood Feud; Blood-Money.

BRETWALDA, brĕt'väl-da, a title of supremacy applied to one among the Anglo-Saxon tribal chiefs or kings, who, it is supposed, was from time to time chosen by the other chiefs, nobility and ealdormen to be a sort of dictator in their wars with the Britons. The following are mentioned by Bede, but Hallam and other historians doubt whether any sovereign in those early times possessed such authority: 492 A.D., Ella, King of Sussex; 571, Ceawlin, King of Wessex; 594, Ethelbert, King of Kent; 615, Redwald, King of the West Angles; 623, Edwin, King of Deira; 634, Oswald, King of Bernicia; 643, Oswy, King of Bernicia. The title appears in different forms as «brytemvalda,» «bretenanwealda,» and from the Anglo-Saxon verb wealdan, to wield, to rule, means most probably «wielder,» «ruler,» or «lord of the Britons.» This «bretwaldship» seems to have been an ephemeral type of dignity, because the consolidation which a prince or king of genius and force won for his territory usually disappeared with his death. Consult Freeman, E. A., ‘History of the Norman Conquest’ (Oxford 1877); Green, J. R., ‘The Making of England’ (London 1897); Kemble, J. M., ‘The Saxons in England’ (London 1876); Rhys, J., ‘Celtic Britain’ (London 1884); Palgrave, F., ‘The Rise and Progress of the English Commonwealth’ (London 1832).

BREUGHEL, brē-hĕl, the name of a celebrated Dutch family of painters, the first of whom adopted this name from a village not far from Breda. See Bruegel.

BREUIL, France, a village of the department of Seine-et-Marne, and the arrondissement of Meaux, celebrated historically as Prodilus or Brodolium in the agricultural district of Brie. It was the scene of the retirement and miracles of Saint Fiacre. Here in the 7th century the saint withdrew and built a monastery which he dedicated to the Holy Virgin and to which he added a small house for guests. Among the latter was Saint Killian, when he returned from a pilgrimage to Rome. Saint Fiacre lived, died and was buried at Breuil, whence his relics were removed in 1568, during the religious wars, to the Cathedral of Meaux. In this neighborhood the Germans were driven back with heavy losses during their advance on Paris in 1914 and forced to retreat to the Aisne. See Fiacre, Saint.

BREUL, Karl Hermann, English-German scholar: b. Hanover, 10 Aug. 1860. He was educated at the universities of Tübingen, Strassburg, Berlin and Paris. He was university reader in Germanic, 1899–1910, and has been professor of German in the University of Cambridge since 1910. He was president of the Modern Language Association, 1910, and is the author of ‘Sir Gowther, a Middle English Metrical Romance’ (1883); ‘Handy Bibliographical Guide to the Study of the German Language and Literature’ (1895); ‘The Teaching of Modern Foreign Languages’ (1909); and numerous contributions to educational, scientific and literary works.

BREVE, brēv, a note of the third degree of length, and formerly of a square figure, as ⊟; but now made of an oval shape, with a line perpendicular to the stave on each of its sides: 𝅜 The breve, in its simple state, that is, without a dot after it, is equal in duration to one-quarter of a large, or to two semi-breves, and is then called imperfect; but, when dotted, it is equal to three-eighths of a large, or to three semi-breves, which being the greatest length it can assume, it is then called perfect. It is now chiefly used at the close of passages or compositions.

BREVE, *in law* (from the Latin *brevis* or *breve*), a diminutive of «brief,» as expressing briefly the intention of the framer, usually a short writ or formal order of royal or legislative issue. In the ‘Corpus Juris’ the word generally means a summary or report. The earliest mention of the breve is by Paulus, C., 220 A.D., in ‘Ad edictum de brevibus,’ quoted in the ‘Vatican Fragment’ par. 310. See Brief; Writ.

BREVET, a term borrowed from the French, and applied in the United States and Great Britain to rank in the army conferred upon officers on account of special, long or distinguished service, and higher than that for which regimental pay is received. Thus a brevet-major serves as captain in his regiment, and draws pay as such.

BREVIARIUM OF EUTROPIUS, the only existing work by Eutropius. It is a treatise in 10 brief books or chapters, recounting the history of Rome from the foundation of the city to the time of Valens, 364 A.D. Its style is notably good and the work, which was expanded by Paul Diaconus, has been much drawn upon by later writers. The best critical editions of 'The Breviarium' are those by Droysen (1879) and Ruehl (1898).

BREVIARY (from the Latin *breviarium*), a summary or abridgment of prayers. The breviary is the book containing the daily offices which all who are in orders, or enjoy any Catholic benefice, are obliged to read. It is an abridgment of similar offices previously in use. The breviary contains prayers or offices to be used at the seven canonical hours of matins and lauds prime, tierce, sext, none, vespers and compline. It is not known at what time the use of the breviary was first enjoined. In the Acts of the Apostles we find the third, sixth and ninth hours especially mentioned. From Clement of Alexandria, Tertullian, Cyprian and others, we learn that the observance of these hours was general among Christians. Saint Basil, Saint Jerome and Saint Ambrose speak of the seven hours called canonical. The services in use in the convents and monasteries in the early ages were very exhausting from their great length. A council held at Tours in 567 enjoined that matins and vespers should never have less than 12 psalms each and that the former should have 30 in Lent. It was under Pope Gregory VII (1073–85) that the abridgment of the offices began to be considered necessary. In 1241 a breviary revised by Haymon obtained the approbation of Gregory IX, and was introduced in all the churches of Rome under Nicholas III. In 1568 Pius V published a breviary which has remained, with few modifications, to the present day. The Roman breviary, however, was never fully accepted by the Gallican Church, which persisted in maintaining its own offices. The Ultramontane party there had long struggled in vain for the introduction of the Roman breviary, but from 1840 to 1864, by a final and vigorous effort, the opposition of the Gallican party was overcome, and the uniformity of usage established, with the following exceptions: (1) Milan Breviary, originating in the time of Saint Ambrose; (2) Monastic, and in use by the Benedictines and Cistercians; and (3) the Dominican.

The Psalms occupy a large place in the breviary, the order of the reading being so arranged that in general 100 psalms shall be recited in a week. Passages from the Old and New Testament and from the fathers have the next place. All the services are in Latin, and their arrangement, which is adapted to the various seasons and festivals of the Church, is very complex. The office for the dead is one of the most venerable parts of the breviary. The English Book of Common Prayer is based on the Roman breviary; the latter, however, excludes the Eucharistic office and services for special occasions, such as baptisms and marriages, and contains lessons and hymns for every day of the year. The breviary must be read aloud, and this duty takes at least two hours. A movement is on foot for its condensation. There is a translation of the breviary into English by the Marquis of Bute (London 1879; new edition, New York 1910). Consult Battifol, 'History of the Roman Breviary' (London 1921).

BREVIARY OF ALARIC, a compendium of Roman law dated from the first decade of the 6th century and compiled at the command of Alaric II, King of the Visigoths. It consisted of abridgments of the code and novels of Theodosius, the institutes of Gaius, etc., and contained a detailed commentary styled the 'Interpretatio.' It was intended for the Roman subjects of the Visigothic ruler, and must not be confused with the 'Forum Judicum' or 'Judicum Liber,' which Alaric put forth for his barbarian vassals. Consult Lee, 'Historical Jurisprudence' (1900).

BREVIPENNES, a family or subdivision of birds, but occupying a different position in different systems. Cuvier makes it a family of the order *Grallæ* or waders. In more modern systems it corresponds to the order of Cursorial birds or *Ratitæ*. It includes at least two genera, the ostrich and the cassowary. The Dodo and Apteryx are also referred to it. The Brevipennes have a resemblance in several of their distinctive characteristics to the *Gallinaceæ*. Their pectoral muscles are reduced to extreme tenuity, and the sternum has no ridge, while the muscles of the thighs are of great strength and thickness. They are thus fitted for walking or running, rather than for flying. As their name implies their wings are short.

BREVOORT, James Renwick, American artist: b. Westchester County, N. Y., 20 July 1832; d. 15 Dec. 1918. He studied art chiefly in Europe and spent several years sketching scenes in England, Holland and Italy. In 1861 he was elected an associate of the National Academy, and in 1863 a full member. In 1872 he was made its professor of perspective. He lived six years in Italy and sketched much in Germany, Holland and England. His specialty as a painter was landscape work, and the following pictures of his are well known: 'Lake of Como' (1878); 'Storm on English Moor' (1882); 'New England Scene'; 'Morning in Early Winter' (1884); 'The Wild November Comes at Last'; 'Windy Day on a Moor' (1886).

BREWER, David Josiah, American jurist: b. Smyrna. Asia Minor, 20 June 1837; d. 28 March 1910. He was graduated at Yale College 1856, at Albany Law School 1858. He studied law under his uncle, D. D. Field, and was admitted to the bar in New York in 1858. Removing to Kansas, he became prominent in his profession. He was judge of the Supreme Court of Kansas 1870–81, and was appointed United States judge for the 8th circuit in 1884. He rendered a memorable decision on the Kansas Prohibition Law, affirming the right of liquor manufacturers to compensation, for which he was severely criticised by the Prohibitionists. While on the State bench he gave an opinion sustaining the Maxwell land grant, the largest private grant sustained in the United States; and a dissenting opinion on the question of the power of a municipality to issue bonds in assistance of railways. President Harrison elevated him to the Supreme

Court of the United States in 1889. He was made a member of the Venezuelan commission by President Cleveland in 1896, and was chosen its chairman. His publications include 'The Pew for the Pulpit' (1897); 'American Citizenship' (1902); 'The Mission of the United States in the Cause of Peace' (1909).

BREWER, Ebenezer Cobham, English author: b. 2 May 1810; d. near Newark, 6 March 1897. He was educated at Trinity Hall, Cambridge, graduated in 1835, and was ordained in the Anglican Church 1836. He was the author of a series of useful reference books, including 'Guide to Knowledge' (1848); 'Dictionary of Phrase and Fable' (1870); 'Errors of Speech and of Spelling' (1877); 'The Reader's Handbook' (1880); 'A Dictionary of Miracles' (1884); 'The Historic Notebook' (1891).

BREWER, John Hyatt, American musician: b. Brooklyn, N. Y., 18 Jan. 1856. He studied piano, organ and theory under local teachers, particularly Dudley Buck. He was organist at the church of the Messiah and the Clinton Avenue Congregational Church, Brooklyn, and since 1881, musical director and organist at the Lafayette Avenue Presbyterian Church in that borough, and professor of music, Adelphi College, 1899–1906; also fellow of the American Guild of Organists, 1902; fellow of the Brooklyn Institute of Arts and Sciences, 1906; conductor of the Apollo Club of Brooklyn since 1903, succeeding Dudley Buck. His compositions include church music, vocal music and works for the piano, organ and orchestra.

BREWER, John Sherren, English historical writer: b. Norwich 1810; d. 1879. He was educated at Queen's College, Oxford, and was ordained deacon in 1837. In 1839 he was appointed lecturer in classical literature in King's College, London, and professor of English language and literature in 1855. He succeeded F. D. Maurice as principal of the Working Mens' College. He was for a time editor of the London *Standard,* retiring in 1856 in order to prepare a calendar of the state papers of Henry VIII, which work he continued until his death. He was appointed rector of Topplesfield, Essex, in 1877. His 'English Studies' were reprinted from the *Quarterly Review* under the editorship of Dr. Wace (1881). His second son was Ebenezer Cobham Brewer (q.v.).

BREWER, William Henry, American agricultural scientist: b. Poughkeepsie, N. Y., 14 Sept. 1828; d. 1910. He was graduated from the Sheffield Scientific School, New Haven, in 1852, and was appointed professor of agriculture there in 1864. He was a member of the National Academy of Sciences from 1880, of the Connecticut State board of health from 1892, and of the State board of agriculture for a long period. He was one of the most prominent American leaders in agricultural research and was a valued authority on all related topics. He did much survey work in the Sierras, one of the peaks of which is known as Mount Brewer. He went to the Arctic regions in the *Miranda* in 1904 and two years later was appointed to the United States Forestry Commission. Besides contributing to the 'Report on Cereal Production' in the United States Tenth Census (1883) he edited the 'Botany of California' (1886).

BREWERTON, Henry, American soldier: b. New York 1801; d. Washington, D. C., 17 April 1879. He was graduated with the class of 1819 at West Point. Commissioned 2d lieutenant in the corps of engineers, he first served as assistant in determining the 45th degree of North latitude at Rouse's Point, N. Y. He was assistant and professor of engineering at West Point (1819–21). Thereafter he was almost continuously engaged in such important engineering works as repairing the fortifications in New York harbor, construction of Fort Jackson, La., of Fort Adams, Newport, R. I., of the defenses of Charleston harbor, S. C., of the fortifications and improvements of Baltimore harbor (1861–64), and of Forts Monroe and Wool, for the defense of Hampton Roads, Va. He was brevetted brigadier-general in the United States army, 13 March 1865, for long, faithful and meritorious services, and was retired from active service 7 March 1867, «having been borne on the Army Register more than 45 years.» Dickinson College conferred the degree of LL.D. upon him, 8 July 1847.

BREWING AND MALTING. Beer is one of the greatest industrial products of many of the foremost nations. America produced during a recent twelve month about 60,000,000 barrels of beer, representing a market value of about $400,000,000, and providing a revenue to the government of approximately $90,000,000 for the year.

Brewing is the process of preparing hopped, fermented beverages, such as lager beer, ale, stout, weiss beer, the materials usually employed being barley-malt, hops and water. *Malting* is the process of preparing cereals, usually barley, through germination, for purposes of mashing and fermentation in brewing, distilling, vinegar- and yeast-making industries.

Prehistoric.— One of the earliest fermented beverages known to tradition, mead, was prepared from honey-water, that is, the washings of honey combs, hence, according to Arnold, the Latin designation for beer, «Cerevisia» originated from the Celtic Keirwysg (Keir-wax; Wysg-water), and not from Ceres-cereals and vis-vigor; «this word was simply retained after cereals were used with the honey and even after cereals were used alone.» J. P. Arnold, 'Origin and History of Beer and Brewing' (Chicago 1911).

What Beer Was and Is.— There is no legally fixed definition of the article or term «beer»; its manufacture and sale come under the provisions of the United States Food and Drug Act of 1906, where it is classed as a «food.» National and State committees and associations on food standards have wrestled with the problem of what beer is long and often, but their labors to propose a satisfactory standard have thus far been fruitless, and all beer standards have therefore remained tentative ones up to the present time.

Beer of Old — Norsemen, Teutons, Germans.—From ancient times down to the present, the beverage that passed by the name of beer has been undergoing so many changes as to material employed, qualitatively and quantitatively, equipment, processes of manufacture and character of product, that it is impossible to fix a standard from usage alone that will not allow the widest latitude as to choice of materials or processes. With the older Norse and South Teutonic, or Germanic tribes, beer was a tart fermented beverage in which honey was a prominent constituent, and about the 11th century the employment of hops became general on the Continent because of its bitter and aromatic and antiseptic principles and tonic effect. Later this ingredient became universal.

Cereal Base.— As to cereal base, barley undoubtedly took the lead from the first, as it was the great staple article of food before wheat displaced it in breadmaking. But other cereals have had their importance in beer-making in ancient as well as modern times. So China made its beer 3,000 years before the Christian era from rice and millet besides barley, and in Egypt, probably as early as the building of the pyramids, millet was employed along with barley. In modern times, the variety of cereals used is much the same. In many countries, notably the United States and Great Britain, unmalted cereals like rice and corn are generally employed and sugars are favored by some. In Germany wheat is employed for some beers, and in France, Belgium and Scandinavian countries various cereal products besides barley malt, such additions to barley malt in these countries being made to secure, especially, better keeping quality and to tone down the satiating effect or richness of all-malt beverages.

The idea that the only pure beer is an all-malt beer is thus seen to be false, both actually and historically, and beer may therefore be defined as follows:

«Beer is an effervescent beverage resulting from the thorough alcoholic fermentation of a hopped solution, in potable water, of the extractive substances principally of barley malt, together with, if desired, other prepared cereals or their natural equivalents.» (Address before the Second International Brewers' Congress, Chicago, Ill., 1911).

This definition includes the German lager beers, such as Pilsener, Wiener, Muenchner; the English beers, such as Mild ales and Stock ales, Porter, Stout; and American beers which are usually designated as draught beers and bottle beers and are mostly patterned after German lager beers, from which they usually take their names, like Pilsener style, Muenchner style, etc., the Pilsener style being light in color and more strongly hopped; the Muenchner style being dark in color and with a more pronounced malt flavor. Weiss beer is a special German brew, light in color and gravity and tart to the taste.

About 95 per cent of the output of American beers is of the lager beer character, with an alcoholic content of 3 to 3½ per cent by weight, and brewed on the average with 10½ to 12½ per cent of extract. Tonics are bottle goods, quite high in extract, and usually with low alcohol content, with highly nourishing qualities.

In prohibition States in the United States, there is a considerable output of near-beers with less than ½ of 1 per cent of alcohol, which, according to the ruling of the Internal Revenue Department, are tax-free. In prohibition Canada, 2½ per cent proof spirits or about 1¼ per cent of alcohol by volume is allowed. In European countries, lower alcoholic beers are privileged in regard to taxation, like Norway with lowest rate for beers up to 2½ per cent of alcohol by weight or approximately 3 per cent by volume. In Denmark beers up to 2¼ per cent by weight or 2.85 per cent by volume are tax-free and considered non-intoxicating. The tax on beers with more than ½ per cent of alcohol by volume, which has been $1.00 per barrel of 31 gallons for years in America, was raised in 1915 to $1.50, and in 1918 to $3.00, the latter being a war measure. By presidential proclamation the brewers are required during 1918 to reduce the amount of grain heretofore employed by 30 per cent, and to reduce the alcoholic content of all beers, other than ales and porters, to at least 2¾ per cent by weight.

Technically, that is, in respect to its manufacture, lager beer may be defined as follows:

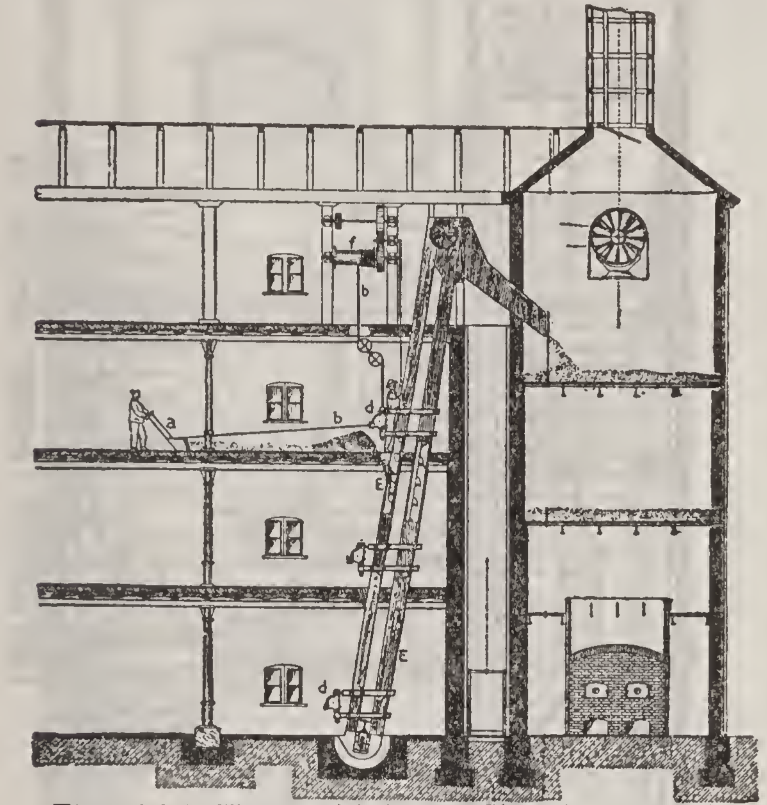
Lager beer is an effervescent sparkling beverage, properly brewed from sound materials, principally barley-malt, with, if desired, prepared cereals like corn or rice or their natural equivalents, hops and potable water; with the resulting brew or wort thoroughly fermented by culture bottom yeast and the fermented product stored in refrigerated cellars for sedimentation; clarified, if desired, by filtration, and properly sterilized, when bottled, by pasteurization.

MALTING.

Malting is the process of preparing cereals through germination or growth for purposes of mashing and fermentation. Barley is the grain commonly used for making malt for lager beer, ale, stout, vinegar and yeast-makers' or distillers' mash, etc., while wheat malt is used to a large extent in the production of weiss beer. The barley is first cleaned in order to remove foreign seeds, straw, broken kernels, etc., by means of sieves and blower fans. As the character of the beer depends largely upon that of the malt, and as the latter's character can be determined during malting, it follows that there are various methods of details in malting. The following are the general manipulations employed:

Steeping.— Malting is in reality an artificial or forced growth of a seed, the changes taking place being similar to those when the seed is planted in the soil. The first requisite is moisture. This is given to the grain by placing it in steep tanks containing water of a certain temperature. Steep tanks are cylindrical iron vessels having conical bottoms so that all the grain will drop out when tank is emptied. They are generally placed on the top floor of the malthouse. The grain remains in the steep tank until it has absorbed the desired amount of water, the time differing for different kinds and quality of grain or the process of the maltster. For barley the duration of steeping is generally from 36 to 60 hours, averaging about 48 hours.

Growing or Germinating Floors.— The malthouse usually consists of several floors. The water in the steep tank is drained off and the wet barley dropped upon these floors below. The barley is now spread in heaps of about 12 to 14 inches high (occupying rather more than one-third and less than one-half of the floor space). The barley now dries out somewhat and begins to sprout or grow and small hair-like fibres, called rootlets, begin to show. As heat is generated during growth, which is undesirable above a certain temperature, and as further proper growth requires pure air, it is necessary to aërate the growing barley (now called green malt). This is done by what is called "turning the heap," which consists of reshoveling the green malt in such a manner that the lower kernels of the old heap will be at the top in the new heap. (During turning, the green malt is thrown through the air in a thin sheet or stream, whereby it is aërated and cooled. The new heap now occupies a larger floor space, is consequently of less height on the floor). This turning is repeated at regular intervals so that at the end of the growing period the heap covers the entire floor to a height of from five to six inches. This growth usually takes about five days, during which time water is sprinkled upon the heap whenever it becomes too dry.



Floor Malt House with Power Shovel, and Bucket Elevator for Green Malt.

Kilning or Drying.— After the green malt shows the desired degree of sprouting, it is necessary to quickly check further growth. This is done by drying it upon the kiln. The green malt is shoveled by means of a power shovel to one end of the floor where it drops through an opening into a bucket elevator and is conveyed to the kiln. The kiln usually has two floors placed one above the other made of strips of wire or perforated sheet metal and heated by means of an open fire from below. Above the upper floor, in the dome, drafts are placed to carry off the vapors, but in modern constructions suction fans are used to promote drying. The green malt is spread evenly upon the upper kiln floor about 18 inches high, where it remains for 24 hours, during which time it is only partially dried. It is now dumped or dropped upon the lower floor (commonly by mechanical dumping floors which turn open in sections on an axis or bearing like the grate in a furnace). The malt on this lower kiln is again spread evenly and then subjected to a higher temperature until the desired degree of dryness is obtained, which usually takes from 20 to 24 hours.

Malt Cleaning.— The malt as it comes from the lower kiln is not yet suitable for brewing as it contains the rootlets and some kernels that were crushed or injured on the floors or during conveying. The malt now passes through cleaning machines consisting of sieves and blowers which remove the rootlets, dust and small and broken kernels.

Mechanical Malting.— As floor malting is restricted to only the cooler months of the year and possesses other disadvantages as to cost of labor and buildings, mechanical systems are coming more and more into use. The steeping of the grain as well as the kiln drying, however, remain generally the same as in the floor system.

Pneumatic Floor Malting.— This system employs box-shaped compartments to hold the grain during the growing period. Through this receptacle air that has been purified and given the proper degree of moisture, as well as cooled or warmed to the proper temperature, is circulated. The conditions of temperature and humidity can thus be made the same all the year round no matter what the conditions of weather may be outside. The green malt in this system is not turned by hand, but by a series of screws or propellers driven by power, traveling through it at regular intervals.

Drum Malting.— The advantages here are similar to those stated above. The drums consist of two concentric cylinders having the same ends. In the space between the cylinders the steeped grain is placed, this space not being filled quite full. The cylinders are perforated with small holes so that moistened or heated or cooled air can be forced through the grain from the centres or sucked through from the outside. By revolving the drum the grain is constantly tumbling, that is, the kernels nearest the inside cylinder fall against the outside cylinder, and this in connection with the air current passing through gives the same turning and aëration to the grain as in turning a heap in floor malting, and requires no labor. There are several systems of malting drums, differing principally in the manner in which the air is warmed and moistened and the direction in which it is forced through the drum.

Brewing Materials, Operations and Equipment, Especially for the Production of Lager Beer.— Beer is produced from the materials, mainly barley-malt, hops, water and yeast, through the processes of cleaning and crushing the malt, mashing of the malt (with or without other cereals); straining or filtering the resulting solution, which contains the extractive substances of the materials from the grains or insoluble portion: washing out the grains with hot water; boiling this solution, which is now termed wort, together with hops; straining or filtering the hopped wort from the spent hops; cooling of the wort; adding yeast for fermentation; drawing off the fermented beer; clarifying and giving life to the beer; racking the beer into trade packages.

Besides these operations, which more particularly concern the character of the finished product, there are many supplementary operations necessary as precautionary measures to ensure freedom of the beverage from taint or contamination of any kind, such as foreign odors or ferments, by varnishing of all large wooden receptacles, such as tanks and casks; staining or otherwise coating iron vessels, such as hop-jack; pitching the wooden trade packages, such as barrels and kegs; thorough cleansing of all beer receptacles and utensils, aseptic or antiseptic treatment of all wort or beer conduits and of cellar floors, walls and ceilings by applying suitable washes, paints or calcimine; treatment of brewing and boiler-feed water, etc.

Brewing Materials.— The materials used in the United States are principally the following: Barley malt is the most important and generally used. It gives to the beer not only its substances, but also to a great extent its character. Malt also supplies peptase and diastase, two substances that change the nature of certain other constituents during mashing. Peptase changes the insoluble albuminoids of the malt into soluble or desirable ones. Diastase changes the unfermentable starch contained in the malt and other materials into fermentable sugars and dextrins.

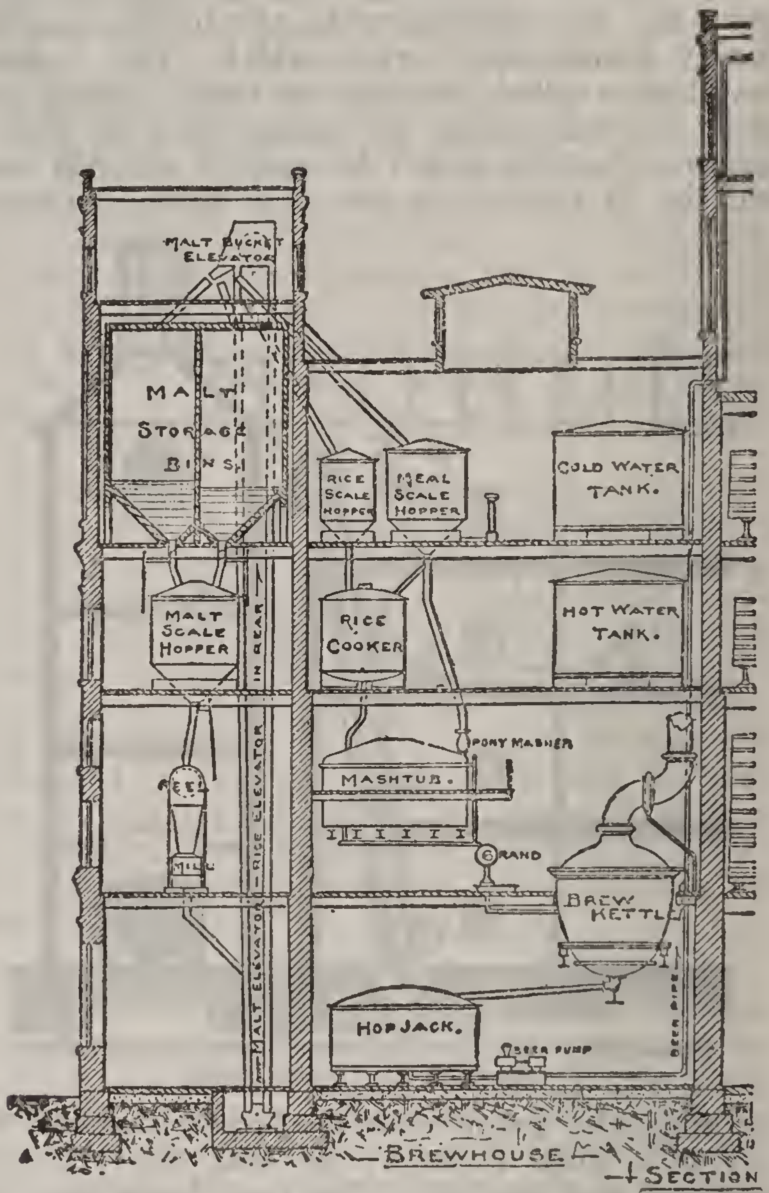
Caramel and black malt, consisting of ordinary malt that has been treated differently during malting, are used to impart color to the wort in order to produce darker beers, also to impart to the beer a more pronounced malt aroma or flavor. Only a small amount, proportionately, of these are used mixed with other materials.

Malt adjuncts or other starch containing materials and brewing sugars are used for the triple purpose: of producing more durable beers, since these adjuncts contain very little albumen; of producing paler beers than could be made with malt alone; and for reducing the cost of production. These are rice and corn products, such as corn grits, corn meal, corn starch, corn flakes and brewing sugars, glucose, etc. Flakes are made by steaming corn grits and passing them through hot steel rollers in order to change them so as to dissolve better during mashing. Flakes and sugars, such as grape sugar, glucose, etc., are sometimes used, instead of corn grits or rice (which require cooking) when a cooker is not installed. Flakes are added directly to the mash in the mash tub and sugars to the wort in the kettle. Brewing sugars are used to a moderate extent only as a brewing material for lager beers, finding more extended use in the production of English beers such as ale, stout, etc.

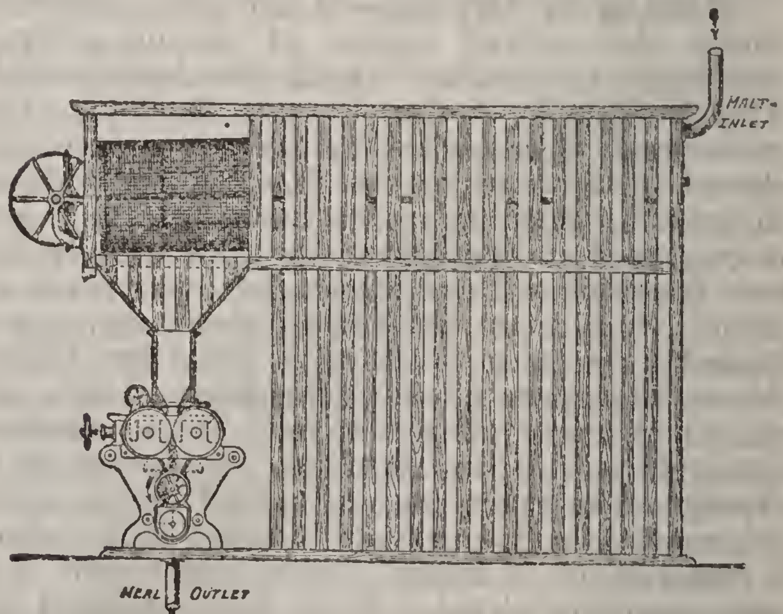
Hops are added to the boiling wort for the purpose of imparting (1) tannin, which aids in the elimination of undesirable albuminoids in the wort; (2) hop oil, which gives the beer its hop aroma, and (3) hop resin, which gives the beer its bitter taste and furthermore tends to preserve it. Water acts as a solvent for the substances contained in the beer. Its composition has considerable influence on the character of the beer produced. It must contain certain mineral substances. See HOPS.

Equipment and Operation.— Modern breweries are usually divided into three departments, namely, the elevator or millhouse where the materials are prepared and weighed; the brewhouse, where the wort is produced, and the cellars where the wort is fermented and treated to produce the finished beer. The arrangement is on the gravity plan, that is, in each department the material of wort or beer is elevated or pumped only once to the top and from there descends through the different stages of manufacture by gravity.

Elevator or Millhouse.—Here the malt is cleaned and stored. The desired amount of malt for the beer is weighed out in a scale hopper, and from thence passes through the malt mill where it is crushed so as to loosen the starch in the kernels. The crushed malt is then transferred to the storage hoppers in the brewhouse ready for use. Rice and corn goods are either stored in the millhouse, weighed in bulk and elevated to a storage hopper in the brewhouse, or dumped (usually in smaller breweries) directly from the sacks into the cooker.



Mill and Brew House.

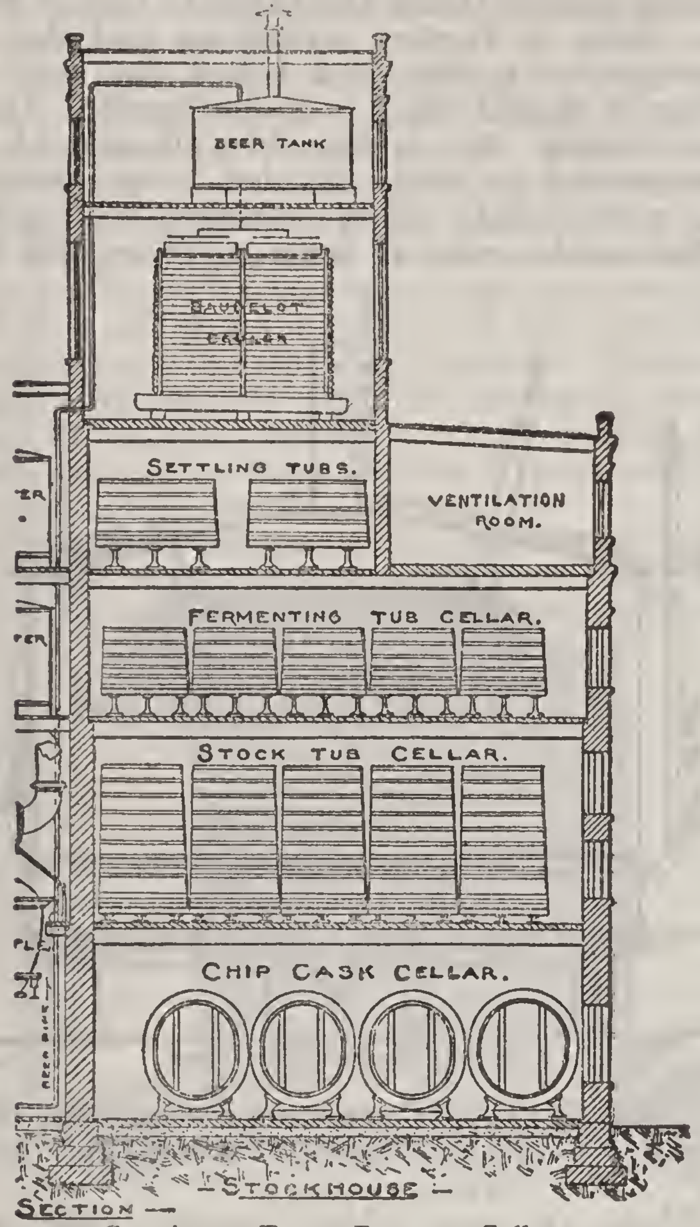


Malt Mill and Screening Reel.

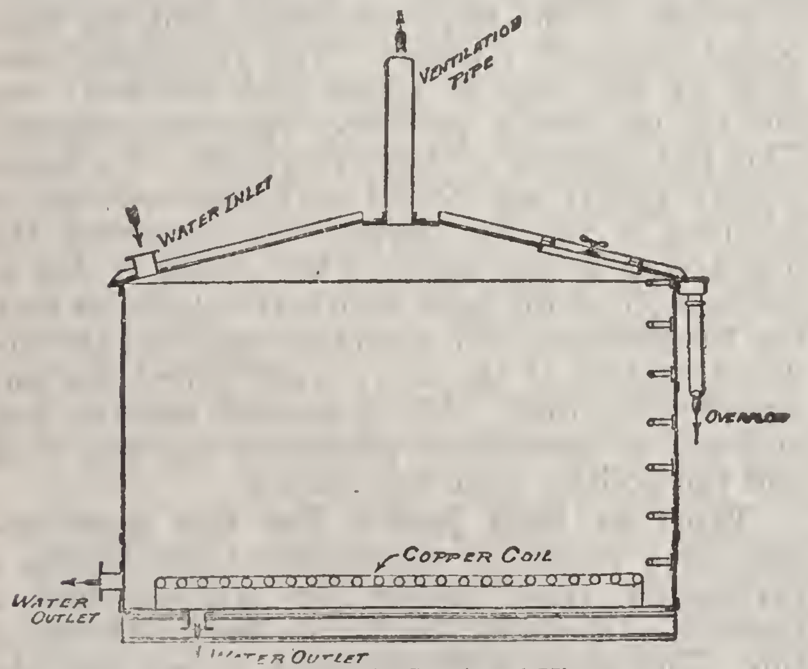
Brewhouse.— The brewhouse generally contains the following vessels: hot and cold water tanks; malt and cereal (rice or corn) hoppers;

the cereal cooker, mash tub, kettle and hop jack and cooler.

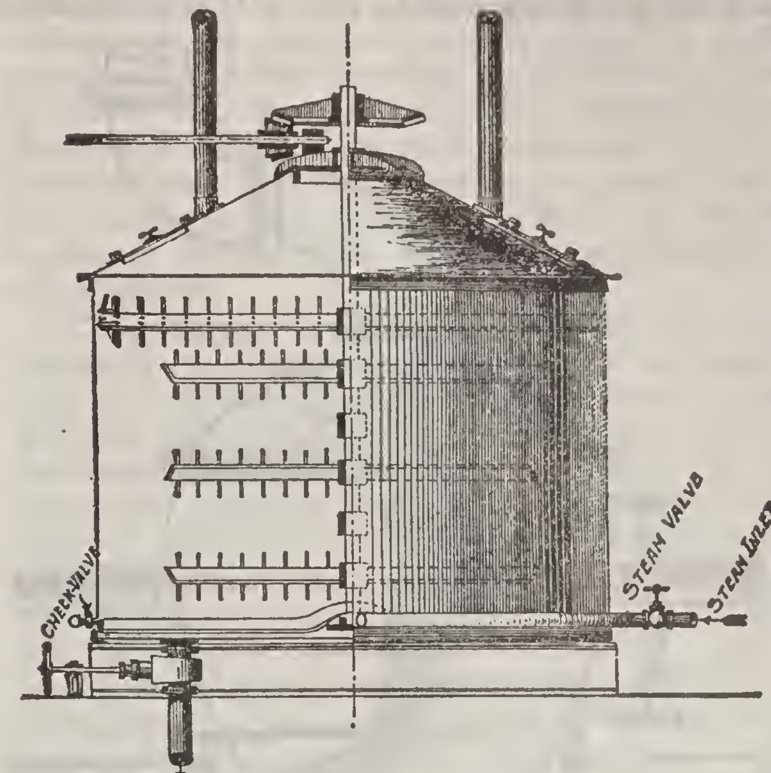
Mashing in Cereal Cookers.— Cookers are of two kinds — open ones or, as they are usually called, rice tubs, and closed or pressure cookers. In these vessels rice or corn (grits or meal) is boiled for a certain length of time in order to loosen up or soften the hard flinty condition of their starch so as to render it able to be more completely dissolved or acted upon in the mash tub. Crushed malt to the amount of about one-quarter the weight of corn goods is added in the open cookers. The mashing method in the open cooker varies somewhat among different brewers, the following being about the average method: The materials are mixed with water so as to have a temperature of 30° R. (100° F.). The mash is held at this temperature for about 15 minutes then run up to 56° R. (158° F.), and held for 30 minutes, then heated quickly to boiling and boiled from 45–75 minutes for corn goods, depending on the fineness of the material, and 30 minutes for rice. The cereal mash is then run down to the mash tub where the mash is finished. Pressure cookers are used to some extent, but not generally, in American breweries. They differ from the open cookers in that, being closed, the mash can be boiled under pressure and, consequently, at a higher temperature than in open cookers. Hereby a more complete softening or dissolving of the starch is obtained and consequently a better yield or extraction of the materials.



Gravity or Tower Brewery Cellars.

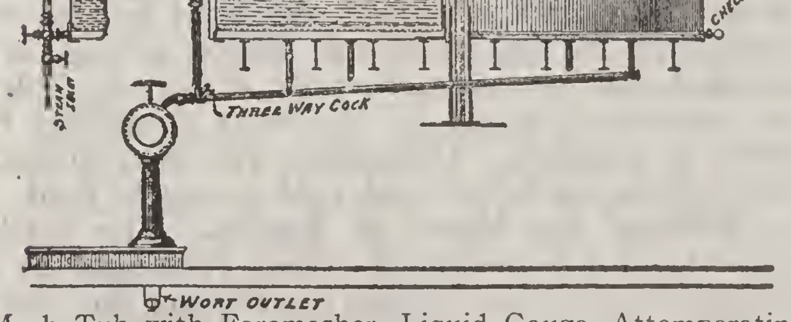


Hot Water Tank, Sectional View.



Cooker, showing Stirrer and Steam Connection.

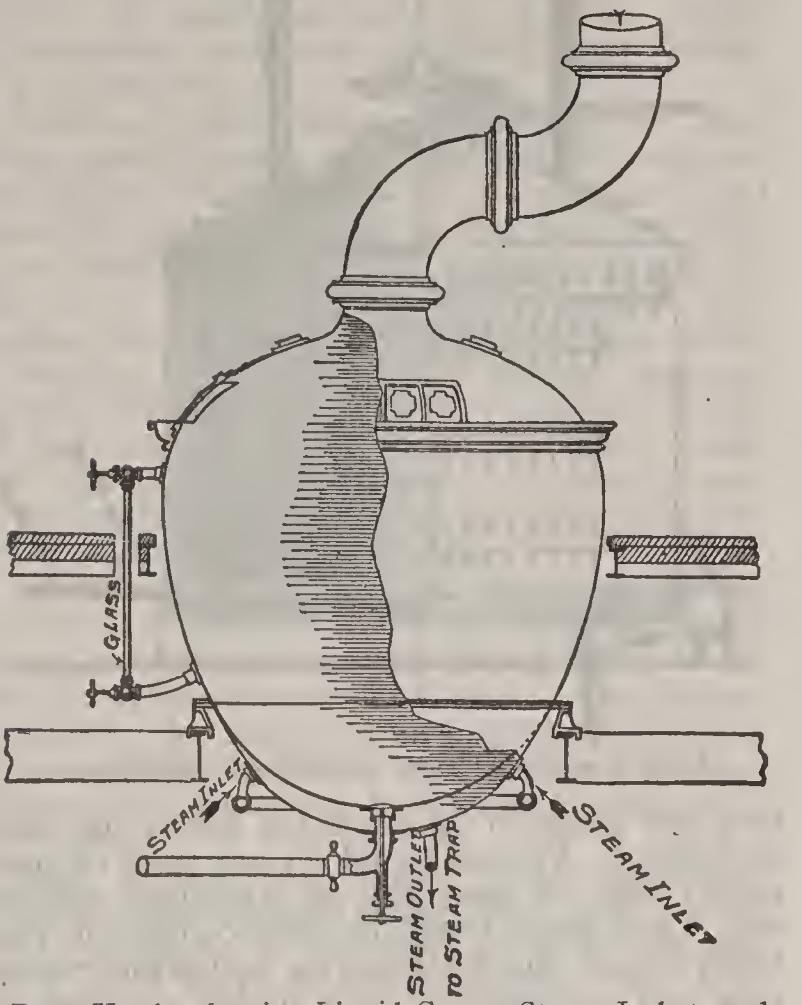
Mashing in Mash Tubs.— The mash tub, like the open cooker, has a stirrer, and a heating coil, but is further supplied with a strainer or perforated false bottom for clarifying the wort, and a sprinkling device or sparger for washing out the grains. In the mash tub the mash is started and, when the mash from the cooker has been added, the combined mash is finished. The mashing method here varies considerably, depending upon the character of the beer that is to be produced, and is consequently



Mash Tub with Foremasher, Liquid Gauge, Attemperating Device and Three-way Cock.

one of the most important of the brewing operations.

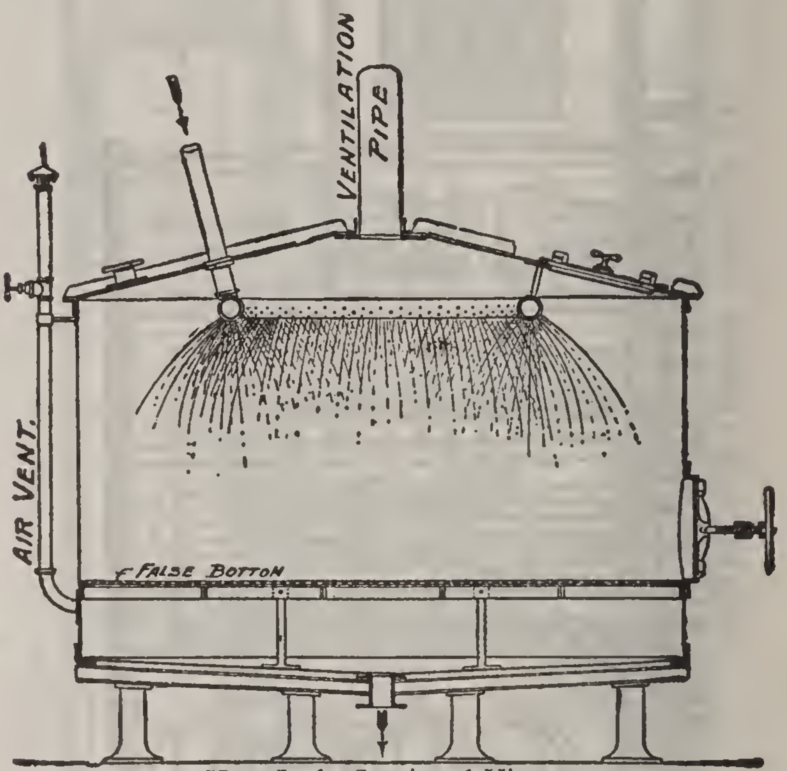
The method of mashing for the production of a beer of average character is approximately as follows: The crushed malt and water are mixed so as to have a temperature of 30° R. (100° F.) and the mash allowed to rest at this temperature for one hour. The temperature of the mash is now raised to 54° R. (153° F.) to 55° R. (156° F.), in about 15 to 20 minutes, by running in the boiling corn or rice mash from the cooker (with the addition of steam should same be necessary). This temperature is held for 10 to 15 minutes, during which time the stirrer is operated continuously. It is at this stage that the diastase in the malt inverts or changes both the starch contained in the malt as well as that in the corn or rice into unfermentable dextrin and fermentable sugars.



Brew Kettle, showing Liquid Gauge, Steam Jacket, and Steam Connections.

The mash is now heated with steam and hot water, in 15 to 20 minutes, to 59° R. (165° F.) and the stirrer stopped. The mash is now allowed to rest from 30 minutes to one hour in order to allow the hulls of the malt to settle so as to act as a filtering material for the wort, after which the wort is run into the kettle. After the wort has run off, the solid substances remaining in the mash tub, called grains, are washed out or sparged with water in order to recover as much of the wort contained in them as possible. The grains are then thrown out of the mash tub and sold as cattle feed.

Boiling the Wort in Kettle.— The kettle consists of a pear-shaped copper vessel having a double or jacketed bottom for heating the wort, and a vent pipe to roof for conducting off the vapors generated during boiling. The steam outlet of the coil or jacketed bottom is connected to a steam trap which automatically discharges the water condensed in the coil or jacket without materially reducing the pressure of the steam. The wort as soon as it runs clear from the mash tub is collected in the kettle. Steam is turned on in the kettle as soon as the jacketed bottom is covered with wort. This wort and that continuously running in is then heated to and kept at about 70° R. (190° F.) in order to destroy the action of the diastase and prevent further saccharification in the wort taking place. When the kettle is full or nearly so, steam is further turned on and the wort brought to boiling and boiled for one hour when it should show a good «break.» During this boiling the undesirable albuminoids are precipitated in finely divided form, rendering the wort turbid. Upon continued heating these albuminoids unite or lump together and leave the wort between these lumps clear and transparent. This clarification is called the «breaking» of the wort.



Hop Jack, Sectional View.

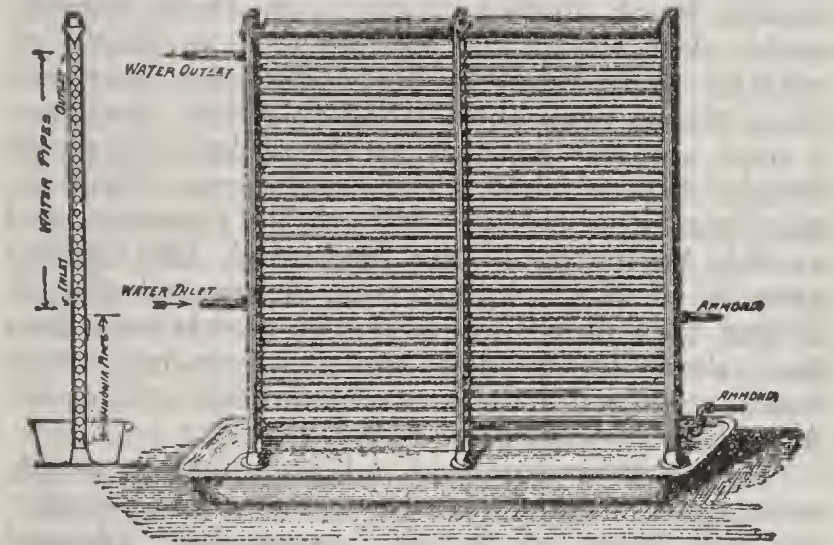
Hops are now added, usually about two-fifths of the total amount used, after which addition the wort again becomes turbid due to the further precipitation of albuminoids by the tannic acid contained in the hops. After about 40 minutes further boiling the wort should again clarify or show its second break, when another two-fifths of the hops are added and the wort boiled about 20 minutes. The remaining one-fifth of the hops is added and the wort run out of the kettle into hop jack immediately. This last quantity of hops is usually of a better quality and is not boiled with the wort as its addition is for the purpose of imparting the hop aroma to the wort. This aroma is due to the hop oil of the hops which is volatile at boiling temperature and would escape, and be rendered useless, if the wort were boiled for any considerable time. All or part of this last hop addition is sometimes placed in the hop jack and the boiling wort run upon it.

Wort in Hop Jack.— The hop jack consists of a round or square iron tank, having a perforated false bottom or strainer and a sparger or sprinkler similar to that of the mash tub. The wort, with the hops, is run into the hop jack and allowed to rest until the hops have settled so as to form a filtering material for the clarification of the wort. As soon as this takes place the wort is pumped to the surface cooler or beer tank located at the top of the cellars. After the wort has all been removed the hops are washed out or sparged with hot water in order to recover as much of the absorbed wort as possible.

Surface Cooler and Beer Tank.— The surface cooler consists of a shallow iron pan of a length and width very large in proportion to its depth so as to give the wort as much surface as possible. Hereby the wort is cooled quite rapidly and aërated.

The beer tank, an iron cylindrical vessel, closed at the top, is rapidly supplanting this cooler, since the latter, by the large surface it presents, exposes the wort to infections by impurities or germs always more or less present in the air. As soon as the wort on the surface cooler or in the beer tank cools to about 50° R. (145° F.) the danger of its infection by impurities, bacteria, etc., begins. From this stage until the beer is finally marketed, months later, it requires the daily, almost hourly, vigilance of the brewer to keep it pure and free from contamination.

Baudelot Cooler.— This consists of a series of pipes or tubes arranged in vertical tiers, over the outside of which the wort flows, while through them the cooling medium is circulated. It is usually made in two sections, the upper being of copper tubes, containing cold water, and the lower of steel containing ammonia.



Baudelot Cooler.

The Cellars.— The wort after cooling enters the cellars, where it is fermented, stored, kraeusened, bunged, fined, filtered and racked ready for the market.

Fermentation of Wort.— The wort as it comes from the cooler is run into fermenting tubs in which the yeast has previously been placed. Sometimes the yeast is added after the tubs are filled with wort. The yeast, from one to one and a half pounds to the barrel of wort, is usually given, not in its natural state, but first mixed with an equal quantity of wort and thoroughly aërated.

The fermentation now begins. Within 15 to 24 hours white bubbles appear on the surface around the sides of the tub. The wort at this time is covered with a head of thick, lumpy consistency composed largely of albuminoid matter. The whole surface now soon becomes covered with a fine white froth, which soon changes to a frizzled appearance called «kraeusen» stage. The froth head then moves toward the centre, the fermentation becomes more active, the froth head rises higher and becomes darker and the fermentation now passes into the «high kraeusen» stage, generally after about 70 to 80 hours. This stage is maintained for about 48 to 72 hours when the head begins to collapse and deepens in color to the end of the fermentation. The temperature is then gradually reduced by means of cooling attemperators to 3° R. (39° F.) in the next three or four days. Total duration of fermentation, 10 to 11 days.

Storage of Beer.— After the wort is fermented the beer is filled into storage vats (closed at the top) where it is stored at a temperature near the freezing point for about two or three months. During this storage period there is a slight progress of secondary or after fermentation and the yeast settles, and, what is most important in bottle beer that is to be pasteurized, there is a further precipitation of albuminoids.

Chip Cask Treatment.— When sufficiently matured in storage the beer is run or pumped into the chip casks, so called because in them wooden chips are placed to retain the sediment produced by the finings. In the chip cask, two properties must be imparted to the beer that it did not possess during storage, namely, life or proper amount of carbonic-acid gas contents and brilliancy. Life is given the beer by addition of 8 to 10 per cent of kraeusen (that is, young beer in the first or kraeusen stage of fermentation). This when added to the old «flat» storage beer continues to ferment, and, as the casks are closed, the gas generated gives life to the whole amount of beer contained therein.

For bottle beer, kraeusen made from grape sugar is used, as grape sugar contains no albuminoids as does the kraeusen from regular fermenting worts.

Brilliancy is given to the beer by removing the yeast and other particles in suspension by means of finings made from isinglass. After bunging the cask, a certain pressure only (4½–5 pounds) is desired and any excess pressure generated above this is automatically removed by an automatic blow-off device called the bunging apparatus.

Filtration of Beer.— Although beers will generally become clear in the chip cask if they are left there long enough, they are now almost universally filtered after they have become moderately fine (clear) in the chip cask. Thereby much time is saved, also a large part of the finings and chips. Furthermore, filtration furnishes a more brilliant beer than can generally be obtained by chip cask treatment only. Modern beer filters differ considerably in construction, but all are alike in that they contain several or many compartments or cells filled with filter mass or pulp (a substance similar to blotting paper) through which the beer is forced. The filter mass or pulp can be used again and again, being washed after each use to remove the beer and sediments it collects during filtration. The operation of filtration is as follows: The bunging apparatus is disconnected and air pressure (15 to 20 pounds) is put on the chip cask and the beer thereby forced through the filter.

Racking of Beer.— From the filter the beer passes to the racking bench which must be placed at a higher level in order to cause a back pressure upon the filter and prevent foaming. The racking device consists of two or more faucets of which one is always open so as to give a steady flow of beer.

Carbonating.— Beer is often carbonated. This is the mechanical forcing of carbonic acid gas into the beer by which time, labor, space and cost of chip casks are saved, besides obtaining a more durable beer.

Pitching and Varnishing.— In order to prevent the beer in wooden vessels from soaking into the wood, they are coated on their insides with an inert or insoluble substance. This is shellac varnish for the large brewery vessels and pitch for the trade packages.

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BREWING INDUSTRY IN AMERICA.

To narrate the history of the art of beermaking is to tell a story that is as old as the human race. To trace the art of brewing from its early days down to the present time it is necessary that one should pass through all the ages of antiquity, for the art that was practiced so crudely by the prehistoric peoples was followed with less primitive methods by both the Egyptians and Assyrians. Later, the Greek and Romans made their brews, while, from the earliest recorded times, the Teutonic races have pursued this art so successfully that praise of their skill has long taken the form of poem and prose, in song and story, while the tributes of esteem that are everywhere paid to Gambrinus, the acknowledged patron saint of brewing, is but another method by which the lovers of beer strive to testify their appreciation of the beverage for which his name stands synonymous.

As far as America is concerned the history of the brewing industry may be traced to 1620, for when the Pilgrim Fathers landed on Plymouth Rock they brought with them considerable knowledge as to the best methods of making their favorite beverages, the fiery potions which even they loved to drink, «and not a man afraid,» as well as the lighter, but still sturdy, brews with which every true Englishman sometimes made «merrie.» Homebrewed as this beer was in the beginning, the natural growth of the colonies soon suggested that it be put to a more practical use, and it was thus that their knowledge of the brewing craft finally resulted in the establishment of the industry of beermaking.

In the New England colonies, where people were more addicted to the use of stronger spirits than beer, the colonial lawmakers adopted a statute by which they granted immunity from taxes and an additional prize in money to any brewer who should be sufficiently energetic to manufacture more than 500 barrels of «honest beer» in a single year, for they held that beer was a beverage which not only added to the prosperity of the country by giving the farmer a profitable market for the grain he might be able to raise, but which supplied the people with a drink of such mild form that, instead of leading to intoxication, it actually contributed to the spread of that temperate spirit upon which the «good order» of the colony so much depended. It was thus that the infant brewing industry was established and fostered by the colonial officials of Massachusetts, and, though the growth of the industry was slow compared to what one would imagine it should have been, it had expanded sufficiently by 1795 to produce nearly 2,000,000 gallons of beer per annum.

The great adversary against which the brewing industry has been obliged to contend has almost invariably been the result of matters of legislation. Ever since the days of the Egyptians the growth or decline in the art of beermaking may be traced directly to this cause. Under liberal laws, intelligently administered, the industry prospered, while legislative enactments have hampered the expansion of the trade more seriously than it could have been retarded by any other influence. Thus, while we have no reason to believe that any laws directly adverse to the brewing craft were passed prior to 1795, the fact that the legislation that was enacted was more favorable to the cheap distribution of distilled liquors had a tendency to give an advantage to the manufacturers and dealers in strong beverages against which the makers of the milder beers found it difficult to contend. It is true that some of the leading men in the country held the opinion that the brewing industry was an aid to the promotion of national temperance and sought to aid it in every way in their power, but they were opposed by strong influences from several quarters, from the few who were opposed to the drinking of even such a mildly alcoholic beverage as beer, to the strong clique which represented the interests of the manufacturers of and dealers in the more potent liquors. During the Washington administration, Congress, in its consideration of the first Federal revenue law, recognized the importance of fostering the brewing industry as an aid to public morality; again, in 1789 Madison publicly expressed the hope that the industry of brewing would extend its influence into every State of the Union, while Thomas Jefferson's firm stand in regard to the liquor question will never be forgotten. «No nation is sober,» he said, «where the dearness of fermented drinks substitutes ardent spirits as a common beverage.»

Prior to the middle of the 19th century, the term «beer» in the United States generally implied that beverage that became more commonly known to us as «ale.» In 1810, when the production of malt liquors in this country amounted to less than 6,000,000 gallons per annum, the 129 breweries which were manufacturing this product made practically nothing but ale and porter, and it was not until about 1846, when the increasing German immigration created the demand for the favorite beverage of these people, lager beer, that any brewer found it necessary to manufacture such a drink. With them, of course, the Germans had brought a practical knowledge of the art of lager beermaking, and as they were not satisfied with the native brews of the Americans, it was not long before lager beer breweries began to spring into existence in every community in which the German population was sufficiently numerous to support such an enterprise. In the beginning, of course, the Americans were inclined to be suspicious of this new beverage. It was milder than their brews, and, at first, they did not take kindly to it, but, gradually, as time passed, their prejudices were overcome until finally beer, or in other words, lager beer, became so popular as a beverage that the production of ale and porter in the United States did not exceed 1,000,000 barrels a year when prohibition went into effect.

It was the outbreak of the Civil War that brought about the financial exigencies which resulted in the adoption of excise measures more favorable to the production of the lighter beverages. To raise a revenue sufficient to save the government from the disasters which threatened required heroic measures. What was required was money, and, as the result, the internal revenue laws were created. As these threw burdens of taxation chiefly upon the manufacturers of ardent spirits, the industry of brewing took a new lease of life, and the effect of the passage of these laws, in July 1862, could be seen in the development of the industry even up to the advent of prohibition.

It was in 1862, at the moment when it was seen that there was to be an opportunity for the advancement of the brewing industry, that the Brewers' Association was formed. While this organization owed its existence partly to selfish interests, to the desire for self-protection and the better advancement of the trade, it declared its fundamental purpose was a more patriotic one, and its members pledged themselves to aid the government in the perfection of the revenue laws so far as they applied to the manufacture of malt liquors, and to assist by their influence in the collection of such revenues, as well as to secure themselves against the possibility of unjust discrimination. After the outbreak of the World War in August 1914, and the decline in imports from Europe consequent thereon, Congress greatly increased the revenue tax on beer and all other alcoholic beverages. Further increases were levied after the entry of the United States into the conflict, but within a few months the necessity for conserving the cereal supply for breadstuffs for the Allies caused the Federal government to limit the output of the breweries. The subjoined table shows the output of the breweries year by year from 1863 to 1916, the last normal year:

BEER PRODUCTION IN THE UNITED STATES FROM 1863 UP TO THE END OF THE FISCAL YEAR 30 JUNE, 1916, IN BARRELS

1863	2,006,625	1890	27,561,944
1864	3,141,381	1891	30,497,209
1865	3,657,181	1892	31,856,626
1866	5,115,140	1893	34,591,179
1867	6,207,402	1894	33,362,373
1868	6,146,663	1895	33,589,784
1869	6,342,055	1896	33,859,250
1870	6,574,617	1897	34,462,822
1871	7,740,260	1898	37,529,339
1872	8,659,427	1899	36,697,634
1873	9,633,323	1900	39,471,593
1874	9,600,897	1901	40,614,258
1875	9,452,697	1902	44,550,127
1876	9,902,352	1903	46,720,179
1877	9,810,060	1904	48,265,168
1878	10,241,471	1905	49,522,029
1879	11,103,084	1906	54,724,553
1880	13,347,111	1907	58,622,002
1881	14,311,028	1908	58,814,033
1882	16,952,085	1909	56,364,360
1883	17,757,892	1910	59,544,775
1884	18,998,619	1911	63,283,123
1885	13,185,953	1912	62,176,694
1886	20,710,933	1913	65,324,876
1887	23,121,526	1914	66,189,473
1888	24,680,219	1915	59,708,217
1889	25,119,853	1916	58,565,532

Whereas, in 1810, there were but 129 breweries in the United States, there were 1,959 such establishments in 1899, ranging in output from about 1,000 barrels annually, to the enormous beer manufactories with an individual output of more than 1,500,000 barrels per annum.

After 1899, the number of breweries steadily decreased, partly through prohibition enactments, partly through the combination of smaller plants or companies into larger organizations, leading to the dismantling of the smaller or less efficiently equipped plants, and also to the erection of new plants, to take over the combined output of the individual units. Thus, in 1910, the number of breweries had declined to 1,568; down to 1915 there was a further decline, the number of breweries according to the Internal Revenue Report being 1,345. On 1 Jan. 1916, six more States were added to the prohibition column, with a total number of breweries of 62, increased by Virginia's six after 1 Nov. 1916, so that the number of breweries operating at the close of 1916 had been reduced to 1,277, to which must be added the breweries of Michigan in 1918 and Montana in 1919, there being then 26 States in which State-wide prohibition had been adopted. In 1917 Congress decreed that a constitutional amendment be submitted to the States providing for the abolishment of the manufacture and sale of alcoholic beverages, to be ratified within six years. This amendment received the ratification of the necessary 36 State legislatures by 16 Jan. 1919; was proclaimed a part of the Constitution the same month, and under the terms expressed therein went into effect on 16 Jan. 1920.

The beer production in the United States showed a marked increase during the 20 years from 1894 to 1914, the output nearly doubling during that time. During the fiscal year 1914 to 1915 there was a decrease of over 6,000,000 barrels, but during the year ending June 1916, notwithstanding the closing of 62 breweries in six more prohibition States, the output of beer was 58,565,532, or approximately that of 1915, and 20,000,000 barrels higher than 20 years before.

Some of the breweries put out of commission by prohibition are operating their plants as best they can by producing «near-beers» or beverages intended to resemble beer as closely as possible but containing less than one-half of 1 per cent of alcohol, which may be sold without a tax and are exempted likewise from the payment of special taxes by dealers in malt liquors. The law does not prohibit the driving off of alcohol from a fermented beverage in the brewery, according to latest rulings of the Internal Revenue Department.

Many other brewers have converted their plants so as to produce other products, candies, beet sugar, etc. Other have been dismantled and the brewing equipment shipped to other countries.

Some few of the breweries made ale, or porter, but the greatest number made nothing but the favorite drink of the Germans, the lager beer which, notwithstanding the inroads of prohibition, continued to be considered as one of the great commercial factors in the United States. Moreover, while the American brewers formerly catered exclusively to a restricted local market, within the years after 1880 the art of beermaking had attained such a point of perfection that this product could be shipped, both in barrels and in bottles, from one end of the country to the other, while a further idea of the immense importance of this trade may be gathered from the facts that while the capital invested in this country in the beer industry was not less than $671,158,000, according to the figures reported by the 1913 United States Statistical Abstracts census, the annual output of the country showed an aggregate value of more than $350,000,000. More than 66,000 men were directly engaged in the interests of brewing, and its contributions to the support of the United States, in internal revenue taxes alone, amounted in 1913 to more than $65,000,000 per annum, while $95,596,000 represented the cost of materials used in that year. That the bottling branch of the industry had also assumed proportions which entitled it to serious consideration is shown by the fact that the product of one brewery alone in 1916 amounted to more than 150,000,000 bottles per annum.

While such figures are available in the sense that they are reliable manifestations of the growth of the brewing industry, there is a deeper and broader side to the question of its development that is a matter of far greater importance, for the modern brewer, while proud of the fact that his craft had grown to be one of the great industries of this great nation, took even greater pride in the knowledge that the science of brewing had made more marked scientific advancement during the past 50 years of its history than it had made in all the years that had previously elapsed since those days of «merrie England» when Falstaff and his coterie of jolly fellows joked together over their generous tankards of some foaming brew.

For example, it may be said that it was only within the 50 years preceding prohibition that anything approaching scientific principles were applied to the art of brewing. After 1870, however, the establishment of brewers' schools to teach the higher knowledge of the craft brought theory and practice into such close association that a field of competition was opened that had never existed prior to that time. Thus, during the sixties the principles governing the production of beer were practically the same as those which had been followed by our forefathers in their breweries in 1805, for while every branch of applicable science, including chemistry, botany and mechanics had experienced marvelous development, these changes meant nothing to the art of brewing, except in the general sense that they were preparing the foundation upon which the more scientific art might be constructed.

The first great improvement in the art of brewing, and especially that portion of it to which the physiology of fermentation may be applied, was the result of the labors of Pasteur in Paris and Hansen at Copenhagen. Pasteur discovered that spoiling of wine, beer and vinegar were due to similar causes, that is, to infection by bacteria or bacilli, and found proper remedies, not only saving those industries in France alone millions of francs annually, but he became the founder of medical science by realizing through his studies on fermentation that contagious diseases in animals and man were due to microbial infection likewise, and thus Pasteur was led to his discoveries of antitoxin treatment. From the earliest days beer had been known to be a perishable product, but the character of the causes which made it spoil was a problem that nobody had been able to solve. By his discoveries of the physiology of the organisms of fermentation Pasteur not only proved that these diseases of beer might rationally be traced to a sort of bacteria but indicated the manner in which such diseases might be avoided through the application of a process of wort cooling and fermentation, while Hansen went a step farther by not only finding another cause for such diseases in the brewers' yeast, which might easily become, by contact, under certain circumstances, with similar organisms closely resembling it, far more injurious than any bacteria, but brought its labors to a most logical conclusion by developing a process of cultivating yeast in large quantities and in such absolute purity from a single germ that he prevented the introduction of wild yeast into the brew. The immediate adoption of these innovations by the leading brewers of the United States resulted in some very material changes in the practical operations of the breweries. Thus the discovery of the principle of preventing infection brought about the substitution of suitably closed apparatus in place of the old-fashioned open cooler, but this improvement was simply one step in the efforts of the manufacturers to meet the requirements of the new scientific methods of brewing. It was followed by more ingeniously constructed machinery, all tending toward a cleaner and better product. There were processes for the production of filtered air; there were other processes for the sterilization of water, for everything that now entered into the product had to be germ-proof, absolute protection against infection being the keynote of the new science. Under these methods, therefore, from the very moment that the beer left the brew-kettle to pass over the coolers, and through the process of fermenting and lagering, and even up to the very moment that it was served as a refreshing and reviving beverage, no effort was spared to protect it from infection. See BREWING and MALTING.

Physiology and theoretical chemistry have also exerted their influence to bring about the present wonderful development in the science of brewing. During the past few decades the most complicated processes in the malting of barley, in mashing and in fermentation have been so thoroughly explored that the knowledge derived from these researches has created a magnificent foundation upon which the maltster and the brewer have been able to build more solidly than ever before in the history of the craft. In this connection, moreover, reference must be made to an invention which has effected more radical changes in the brewing industry than almost any one single factor, for without it many of the innovations and improvements which are regarded as of such vital importance to-day could never have been made. This invention is the ice-machine, without which artificial refrigeration upon any extraordinarily extensive scale, such as exists in many of the big brewing plants at this time, would have been entirely impracticable. It was since 1870 that the imperfect icemaking machine which was shown by the French inventor, Carré, was regarded as so great a curiosity that persons who were interested in such things traveled long distances to inspect it. To-day, however, conditions have changed so materially that it is only the very insignificant brewing establishments that are not equipped with model ice-machines.

One of the distinctly American innovations which tended so greatly to improve the science of brewing during the past few decades was the new method of collecting and utilizing all the carbonic-acid gas formed during the process of fermentation. By the discovery of this purely American method, which has been adopted in Europe, it was made possible to abandon the old-fashioned «kraeusen» process of carbonating, which was formerly the only method in general use. In other words, the finished product of the brewery may now be charged with the best and purest natural carbonic-acid gas that it is possible to obtain, and as this method of collecting this by-product of fermentation produces such an abundance of the carbonic-acid gas that it may readily be liquefied, there is no reason why every other product of that kind should not eventually be crowded out of the market.

Another distinctively American discovery is the treatment of bottled beer and rendering the same chillproof through the application of the principle of digesting the colloidal albumen of beer by means of proteolytic enzymes in the finishing cask, thus giving the bottled product almost unlimited durability.

As this is not the only occasion upon which the American ingenuity has solved problems relating to the science of brewing over which some of the greatest European authorities have experimented vainly for many years, it is not strange that the brewers of the United States should be able to produce some of the best and, at the same time, some of the most durable beer in the world. Not only have the latest and most scientific methods in brewing that can be credited to the European investigators been in use in the country, almost from the very moment of their discovery, but several of the processes which have actually originated in this country have since been accepted by foreign scientists as the most rational methods known. In 1893 Professor Delbrueck of Berlin and Professor Schwackhoefer of Vienna were sent to America by their respective governments to make a detailed inspection into American brewing methods. Naturally every facility was offered them, and in their special report they gave the brewers of the United States much of the credit which they deserve for having developed the primitive craft to such a high standard of perfection.

In 1911 an International Brewers' Congress was held at Chicago in connection with an International Brewers' Exhibit of brewers' machinery, equipment and materials in which the United States Agricultural Department was conspicuously represented.

Revised by ROBERT WAHL.

BREWSTER, Benjamin Harris, American lawyer: b. Salem County, N. J., 13 Oct. 1816; d. Philadelphia, 4 April 1888. He graduated at Princeton in 1834, was admitted to the Philadelphia bar (1838), and for nearly half a century practised with ardor and success the profession he loved. In 1846 he was one of a commission to adjudicate the claims of the Cherokee Indians against the United States; in 1867 he became attorney-general of Pennsylvania, and in December 1881 President Arthur made him Attorney-General of the United States. Shortly after the death of President Garfield, Attorney-General Wayne MacVeagh retained Brewster to assist in the prosecution of the «Star Route» conspirators. In boyhood he was severely injured by burns received while bravely attempting to rescue his sister from a fire into which she had fallen. He was an impressive orator, and possessed scholarly attainments of a high order. Both Princeton and Dickinson colleges conferred the degree of LL.D upon him.

BREWSTER, Chauncey Bunce, American bishop: b. Windham, Conn., 5 Sept. 1848. He is a direct descendant of Elder Brewster of

Plymouth colony fame. He was graduated at Yale in 1868, Berkeley Divinity School 1872, and was ordained priest 1873. He was rector of Christ Church, Rye, N. Y., 1873–81; Christ Church, Detroit, 1881–85; Grace Church, Baltimore, 1885–88; Grace Church, Brooklyn, N. Y., 1888–97. On 8 June 1897 he was elected coadjutor-bishop of Connecticut and consecrated in New Haven, 28 Oct. 1897. Upon the death of Bishop Williams, in 1899, Bishop Brewster became diocesan of Connecticut. Besides sermons and pastoral charges, he has written ‘The Key of Life’ (1885); ‘Good Friday Addresses’ (1894); ‘Aspects of Revelation’ (1901), being the Baldwin lectures before the University of Michigan; ‘The Catholic Ideal of the Church’ (1905); ‘The Kingdom of God and American Life’ (1912); also addresses, etc. Yale University, Wesleyan University and Trinity College have conferred the degree of D.D. upon him.

BREWSTER, Sir David, Scottish natural philosopher: b. Jedburgh, 11 Dec 1781; d. Allerby, near Melrose, 10 Feb. 1868. He entered the University of Edinburgh, was educated for the ministry and was licensed by the Presbytery of Edinburgh; but gave up the ministry to engage in scientific pursuits. His first investigations were on the subject of polarization of light, upon which he communicated some important observations to the ‘Transactions of the Royal Society of Edinburgh.’ In 1881 he became editor of the Edinburgh ‘Encyclopedia,’ to which he contributed a number of valuable articles. In 1816, while repeating the experiments of Biot on the action of fluids on light, he made those observations which resulted in the invention of the kaleidoscope. In 1819, in conjunction with Jameson, he founded the Edinburgh *Philosophical Journal,* of which he was sole editor (1824–32). Brewster was one of the founders of the British Association, whose first meeting was held in York in 1831, and he presided over it on the occasion of its 20th meeting held at Edinburgh in 1850. In 1832 he received the honor of knighthood along with a pension from the government. Both before and after this time his services to science obtained from many quarters the most honorable recognition. The French Institute, of which he had been a corresponding member since 1825, appointed him one of its eight foreign associates in 1849. From Prussia he received the Order of Merit in 1847, and in 1855 the cross of an officer of the Legion of Honor was bestowed on him by Napoleon III. From 1838 to 1859 he was principal of the united colleges of Saint Leonard's and Saint Salvador at Saint Andrews, and in the latter year he was unanimously chosen principal of the University of Edinburgh — an office which he held till his death. His chief works are ‘Treatise on the Kaleidoscope’; ‘Letters and Life of Euler’; ‘Letters on Natural Magic’; ‘Treatise on Optics’; ‘Martyrs of Science’; ‘More Worlds than One’; ‘Memoirs of the Life, Writings and Discoveries of Sir Isaac Newton’ (1855). Consult Gordon, ‘The Home Life of Brewster’ (Edinburgh 1869).

BREWSTER, Frederick Carroll, American lawyer: b. Philadelphia, Pa., 15 May 1825; d. Charlotte, N. C., 30 Dec. 1898. He was graduated from the University of Pennsylvania, read law with his father and was admitted to the Philadelphia bar, 1844, of which he became a leader and one of its brightest ornaments. He was elected city solicitor (1862); judge of the Court of Common Pleas (1866–69); attorney-general of the State (1869–70). He was successful as counsel in the famous Stephen Girard will case, and secured the decision in the Chestnut street bridge case, wherein a decree was entered in the United States Supreme Court allowing the city of Philadelphia to cross the Schuylkill River by bridge. He published ‘Reports of Equity, Election and other Cases in the Courts of the County of Philadelphia’ (1869); ‘Digest of Pennsylvania Supreme Court Cases’ (1869); ‘Brewster's Blackstone, with Annotations of Decisions on the Rule in Shelly's Case’ (1887); ‘Brewster's Reports’ (4 vols., 1869–93); ‘A Treatise on Practise in the Pennsylvania Courts’ (1887–88).

BREWSTER, Harlan Carey, British Columbia statesman: b. Harvey, New Brunswick, 10 Nov. 1870. He early migrated to British Columbia, where he was for a time purser on board a vessel, and afterward manager of the Clayoquet Sound Canning Company before engaging in business on his own account. He was returned to the local legislature for Alberni in 1904 and for Victoria in 1907, for some years led the opposition, and on the defeat of the Bowser government in 1917 became Premier of the province.

BREWSTER, William, elder of the Plymouth Pilgrims: b. Scrooby, England, 1560; d. Plymouth, Mass., 16 April 1644. He was educated at Cambridge and entered the service of William Davison, Ambassador in Holland, but presently retired to Scrooby manor house in Nottinghamshire, where his attention was chiefly occupied by the interests of religion. He was one of the company who with William Bradford attempted to find an escape to Holland and were thrown into prison at Boston. Having obtained his liberty, he first assisted the poor of the Society in their embarkation and then followed them to Holland. Here he opened a school at Leyden for instruction in English and also set up a printing press. He was chosen a ruling elder in the church at Leyden, and came to New England in 1620 with the first company of the Pilgrims. Until 1629 the principal care of the church at Plymouth devolved upon him, though as he was not a regular minister, he could never be persuaded to administer the sacraments. Consult Steele, ‘Chief of the Pilgrims’; ‘Life of William Brewster’ (1857).

BREWSTER, William, American ornithologist: b. Wakefield, Mass., 5 July 1851; d. 11 July 1919. A graduate of the Cambridge High School, he was curator of the collection of birds and mammals of the Boston Society of Natural History, 1880–87; curator of the department of mammals and birds 1885–1900, and after the latter year, of birds alone at the Cambridge Museum of Comparative Zoology, his own private museum of ornithology also occupying a great deal of his attention. He is author of ‘Bird Migration’ (1886); ‘The Birds of the Cape Region of Lower California’ (1902); ‘The Birds of the Cambridge Region of Massachusetts’ (1906).

BREWSTER'S LAW. See LIGHT; REFLECTION; REFRACTION; DISPERSION.

BREWTON, Ala., city and county-seat of Escambia County, 102 miles southwest of Montgomery, on the Louisville and Nashville Railroad. It has wood manufacturing interests and a large trade in truck farm products. It is the seat of Brewton Collegiate Institute and an industrial school for girls. Pop. 2,685.

BREYMANN, brī'man, **Hermann,** German philologist and pedagogue: b. Oker, near Harzburg, 1843; d. 1910. He studied languages at Göttingen, Bonn, Marburg and Paris; lived in Manchester and London 1867–75; in the latter year was appointed professor of French and English in the University of Munich, and came to be recognized as one of the leading authorities on educational questions in relation to modern languages. From 1890 he was editor of the *Münchener Beiträge zur romanischen und englischen Philologie.* He is the author of 'Bearing of the Study of Modern Languages on Education at Large' (1872); 'On Provençal Literature' (1875); 'Diez, sein Leben, seine Werke' (1878); 'Marlowe's Dr. Faustus' (1889); 'Die neusprachliche Reform-Litteratur 1876–93 (1895); 1894–99' (1900); 'Die phonetische Litteratur von 1876–95' (Leipzig 1897); 'Calderon Studien' (1905).

BRIALMONT, Henri Alexis, distinguished Belgian military engineer: b. Venloo, 25 May 1821; d. 21 Sept. 1903. The son of a general, he studied at the École Militaire under French officers and entered the Belgian army (engineer corps) in 1843. He devoted himself entirely to the theory and construction of fortifications and came to occupy in the modern history of fortifications the high place held by Marshal Vauban (q.v.) in the 17th century. By 1855, despite his French training, he had abandoned French models and leaned to the German theories, rejecting the old star-shaped forts with bastioned ramparts and intricate outworks, for the German type of long front and detached forts. In 1847 he constructed the fort works at Diest and later served three years as secretary to the War Minister, General Chazal. Brialmont's first great work was the fortification of Antwerp, completed in 1868. His revolutionary plans for fortifying vulnerable points in Belgium were unfavorably received during his term (from 1875) as inspector-general of fortifications and of sappers and miners in Belgium. Discouraged at meeting opposition, Brialmont accepted an invitation from the late King of Rumania to design the proposed gigantic defenses of Bucharest, whither he went in 1883. Owing to representations made by Austria-Hungary to the Belgian government, Brialmont was retired from the Belgian army for undertaking foreign service without permission. In 1884, however, he was restored to his rank, and in the following year, when he had reached the age limit, his services were nevertheless retained to complete the defense works of the Meuse Valley in the forts of Liége and Namur. He achieved the task by 1892, while in the meantime he continued to direct the Rumanian defense works. Brialmont's typical fort is adapted to meet long-range rifled guns and high-angled shell fire. Whereas the military engineer of pre-artillery days piled his towers and turrets high into the air, the advent of heavy guns compelled them to be built ever lower to earth. Brialmont's forts are buried underground with disappearing cupolas in which the guns are mounted. All that is normally visible is a low mound, surrounded by a deep ditch. The mound is cased in concrete and heavy masonry, roofed with concrete and covered with earth and sods. The top is broken by circular pits, in which the cupolas or gun-turrets slide up and down with just enough movement to bring the gun muzzles above the level of the ground. Internally the mound resembles a vast molehill containing numerous passages and chambers, divided into quarters for the garrison, machine rooms and munition stores. An inclined tunnel forms the entrance to the fort. The German invasion of Belgium in 1914 demonstrated the futility of fortifications as a defense against modern long-range heavy guns. The Liége forts were reduced in two days and Namur fell in a few hours. Brialmont also wrote many works on military history and tactics. In 1850 he founded the *Journal of the Belgian Army* and published 'Précis d'art militaire' (1850); 'Considérations politiques et militaires sur la Belgique' (1852); 'Histoire du Duc de Wellington' (3 vols., 1856); 'Études sur la défense des etats et sur la fortification' (3 vols., 1863); 'Situation militaire de la Belgique' (1888); about 30 other books and some 60 pamphlets on political and military subjects.

BRIAN (surnamed «BOROIMHE or BORU, «of the tribute»), King of Ireland: b. 926; d. 23 April 1014. He was the son of Kennedy, King of Munster. At first chief of Thomond, or north Munster, Brian became King of Ormonde on the death of his brother in 976. He rose step by step until his authority was undisputed throughout all Munster, whose chiefs became his tributaries and his allies. The Danes he had repeatedly chastised, and in 1002 he took up arms against Malachy (Maolseachlainn), the Ard-Ri, or High King, and compelled him to abdicate in his favor. Brian was now the chief king of all Ireland and established his court or fort at Ceann Coradh (Kincora), on the banks of the Shannon, a few miles above the city of Limerick. Malachy's deposition and the consequent elevation of Brian gave Ireland the greatest of her high-kings and the country for some years enjoyed unbroken peace. War came when the discordant elements coalesced. Brian had alienated the Leinster men by reviving the Boroimhe, or tribute; he had crushed the Danes of Limerick and Waterford; and these, with the Danes of the Isle of Man and those of Sweden and the Scottish Isles, joined together and, on 23 April 1014, their united hosts faced Brian at Clontarf, on the north shore of the Bay of Dublin. The victory gained by the latter was decisive, the Danes being put to utter rout and their power in Ireland broken for all time. It was a dearly-bought victory, however, for Brian, his son and grandson were among the slain at the close of the day. Brian was no less distinguished as a peace administrator; by establishing harmony among the various discordant elements of his native land, thus permitting education and the arts to be practised and developed, he contributed in no small degree to the progress of civilization. His surname, «of the tribute,» was bestowed on him from the circumstance of his having revived the ancient tribute exacted by the high-king from the rulers of the provinces. Fact and fiction have in the course of the centuries become so intermingled that at this distance it is difficult to form a just estimate of Ireland's warrior chief.

BRIANCHON, brẹ-äṅ-shôṅ, **Charles Julien,** French mathematician: b. Sèvres 1785; d. 1865. Besides some important papers contributed to French mathematical journals, he has left small treatises on lines of the second order (1817), and the application of the theory of transversals (1818). He is best known by a theorem, the correlative of Pascal's which he published in 1806. The theorem is: If a hexagon is circumscribed to a conic, the straight lines joining the three pairs of opposite vertices are concurrent.

BRIANÇON, brẹ-äṅ-sôṅ, France, town in the department of Hautes-Alps, on the right bank of the Durance, 35 miles northeast from Gap, and near the Italian frontier. It is a fortress of the first class, occupying an eminence at the foot of the Col de Genèvre, 4,284 feet above the level of the sea, and has sometimes been called the Gibraltar of the Alps, forming, as it does, a central point from which troops can be marched to all their most important passes. It manufactures silk, cotton, hosiery and cutlery. Briançon is a town of great antiquity. According to Pliny it was founded by the Greeks. In Roman times it was known as Brigantium, on the direct route from Italy to Embrun and Gap. It was fortified by the French in 1722. Pop. 7,888.

BRIAND, Aristide, French Premier: b. Nantes 1863. Educated for the law, he spent 15 years of a wandering life as barrister, as journalist connected with such journals as *L'Humanité*, *La Lanterne* and *La Petite République*, as trade-unionist, as orator, political organizer, congressman and as general secretary to the French Socialist party. An optimist feeling acutely the injustice of the social state toward the proletarian victims of our economic system, he won widespread popularity with the masses by his sympathetic attitude. To his oratorical gifts Briand owes his rise to public prominence. The possessor of a penetrating voice, audible in its lowest tones at the remotest corner of the chamber, it is called the most seductive voice heard in the Palais Bourbon since Gambetta's. In 1902 he was elected to the Chamber of Deputies; in 1906 he became Minister of Public Instruction and Worship, administering the law with tactful wisdom, although accused of being anti-clerical. In 1909, in 1913 and in 1916 he was Prime Minister; in 1910 earning much adverse criticism and suspicion of having become anti-socialist, through his efficacious suppression of a widespread strike of railroad employees, by calling them all to the colors, thus exposing the persistent strikers to charges of insubordination and breach of military discipline. As ‹Briand the Brilliant› he was one of the foremost strong men on whom France relied during the World War crisis. In 1920 he again was made premier.

BRIAND, Jean Olivier, Canadian clergyman: b. Plérin, Brittany, 1715; d. 1794. He was elected vicar-general of Quebec in 1760; was bishop of the diocese 1766–84, and in the trying period following the cession of Canada to the British Crown showed both tact in dealing with the new rulers and a due sense of the rights of the Church.

BRIANSK, bryänsk, Russia, town in the government of, and 70 miles west-northwest from Orel, on the right bank of the Desna. It is surrounded with an earthen rampart, contains 16 churches, a monastery, with a seminary and two poorhouses. It has a considerable trade in grain, hemp, hemp-oil (sent to Petrograd and Riga), honey and wax; and in linen, cables and cordage, ironware, bark, mats, lime and tar, which are sent to Kherson, Odessa and other ports of the Black Sea. It contains imperial building-yards, for which the oak forests in the neighborhood supply material. Near it are a cannon foundry and a manufactory of small arms. In the neighborhood is situated the monastery of Svensk-Uspensk, dating from the 13th century. Pop. about 24,000.

BRIARE, brẹ-är, France town in the department of Loiret, on the Loire, 25 miles south of Montargis. The canal, to which the town is indebted for its importance, is the oldest work of the kind in France, having been begun in the reign of Henry IV, though it was not finished till 1740. It establishes, by means of its junction with the canal of Loing at Montargis, a communication between the Loire and the Seine and conveys the various products of the province, watered by the former, to Paris. Pop. 5,700.

BRIAREUS, brī-ā'rẹŭs (also called ÆGÆON), a giant with 100 arms and 50 heads, the son of Uranus and Gæa. His two brothers, Cottus and Gyes, were formed in a similar manner, and their formidable appearance struck their father with such terror that he imprisoned them at their birth in the bowels of the earth. In the war with the Titans, Jupiter (Zeus) set them free and by their assistance gained the victory. When Juno, Neptune and Minerva conspired to bind the sovereign of the gods, Thetis brought Briareus from the depths of the sea (how he came there is not known) to the relief of the trembling Jove. Virgil places Briareus in the vestibule of hell. He was employed with his hundred-handed brothers in watching the Titans in Tartarus. Various other fables are told of these gods, who are supposed to be personifications of the extraordinary phenomena of nature manifested in volcanoes, earthquakes and other commotions.

BRIBE, a reward given to a public officer or functionary to induce him to violate his official duty for the benefit or in compliance with the wishes of the party by whom or on whose behalf the bribe is given or promised. Bribery, at common law, is the receiving or offering any undue reward by or to any person whomsoever, whose ordinary profession or business relates to the administration of public justice, in order to influence his behavior in office and to incline him to act contrary to his duty and the known rules of honesty and integrity. Certain writers limit bribery at common law to persons concerned in the administration of justice. The offense is much broader than this according to the weight of authority. It is said by Bishop to be the voluntary receiving or giving of any thing of value in payment for an official act done or to be done, and that it is not confined to judicial officers or other persons concerned in the administration of justice, but that it extends to all officers connected with the administration of the government — executive, legislative and judicial, and, under the appropriate circumstances, military. In nearly all of the States of the American Union, however, the offense is now defined by statute, so that a resort to common law is not often necessary, except for general principles. Bribery may be committed with respect to officers *de facto* as well as officers *de jure*. The offense of the giver and of the receiver of the bribe has the same name. For the sake of distinction, that of the former — that is, the briber — might be called active bribery; while that of the latter — that is, the person bribed — might be called passive bribery. The thing offered or accepted need not be money, but may be property, services or anything else of value. It must be of some value, but as the essence of the offense is its tendency to prevent justice in any of the departments of government, executive, legislative or judicial, the degree of value of the bribe is not essential. It has been held, however, in Indiana, under a statute prohibiting the giving or receiving anything of value, that an officer who received a note could not be convicted, because the note, not being enforceable, was of no value.

At common law and under the statutes, in order to constitute bribery there must be a corrupt intent to influence the officer or other person, or on his part, to be influenced, in the discharge of his official duties. It is not essential, however, unless specially required by a statute, that the act induced, or sought to be induced, shall favor, aid or benefit the person giving the bribe himself. The act which is induced or sought to be induced by the bribe must be an act in discharge of a legal duty. It is not bribery if the act is in discharge of a mere moral duty. Bribery is regarded in the United States as being of such a serious nature that it is made a felony in nearly all of the States, and the punishment for the various species of bribery may be, in New York and many other States, imprisonment for a period not exceeding 10 years. «Bribery at common law, in a judge in relation to a cause pending before him, was regarded as an offense of so grave a nature that it was sometimes punished as high treason before the 25 Edw. III, and at this day is certainly a very high offense and punishable not only with forfeiture of the offender's office of justice, but also with fine and imprisonment,» etc. Bribery in England is punished in inferior officers with fine and imprisonment, but in judges, especially the superior ones, it has always been looked upon as a heinous offense. In the United States in many jurisdictions bribery at elections, either effected or attempted, is a disqualification for office, and an election procured by bribery is void. An attempt to bribe, though unsuccessful, has been held to be criminal and is punished in many States as severely as the substantive offense. The reason for the law is plain. The offer is a great temptation to the weak or depraved. It tends to corrupt, and as the law abhors the least tendency to corruption, it punishes the act which is calculated to debase, and which may affect, viciously, the morals of the community. See CORRUPT PRACTICES ACT.

BRICE, Saint, French prelate: b. Tours; d. there, 13 Nov. 447. He is commemorated on 13 November. On the death of Saint Martin he was made bishop of Tours. Saint Brice's Day, 1002, is memorable in old English history for a great massacre of the Danes. It was believed that it was a concerted attempt to exterminate all the Danes in England; but, failing of its bloody purpose, it led to reprisals by the Danish King Sweyn. To him is attributed the foundation of many churches, great success in converting the pagans and numerous miracles. Consult Gregory de Tours, 'Historia Francorum' (bk. II), and 'De Gloria Martyrum' (Vol. I, p. 95); Baillet, 'Vie des Saints' (Paris 1701, Vols. III and XII), and 'Gallia Christiana' (Vol. XIV, pp. 10–11); 'La Grande Encyclopédie' (Vol. VIII).

BRICK, Jefferson, a figure in Dickens' 'Martin Chuzzlewit,' intended as a caricature of an American journalist of 60 years ago.

BRICK, a rectangular mass of clay and sand, dried in the sun or baked in a kiln and used for building purposes. To mold wet clay into cubes for the erection of walls and houses was one of the first efforts at architecture. There still exist in perfect preservation sun-dried bricks made by the Babylonians and Egyptians over 4,000 years ago. On some of these are inscriptions relating to the cause of their making, family history, etc. In many cases, straw was mingled with the clay in order to give it greater coherence. The story of the Egyptian taskmasters and the brick-making Israelites, told in Exodus i, 14; v, 4–19, is too well known for further reference here. Scarcely less ancient than these Babylonian and Egyptian bricks are the «adobe» bricks of Yucatan and Mexico. There are in Colorado, Arizona, New Mexico, Texas and California hundreds of these 'dobe houses, some of them more than 300 years old and still inhabited. The Aztecs and other American aborigines were adepts at using this material and constructed wonderful architecture out of it. The present Indian town of Laguna, in New Mexico, illustrates the decadence of this art, which the Spanish found so perfect in old Mexico.

Bricks are made of clay and sand, molded and dried or burned. Sometimes a proportion of other substances may enter into their composition. Iron is usually present in clay soils, and the iron oxide gives the red color familiarly seen in common brick. A brick may be darkened by overburning, or if underburned it is known as salmon brick from its light color. By introducing lime as a constituent the color may be lightened, and the sand-lime brick is nearly pure white. A little magnesia in the mixture yields a brown brick. A number of the mineral oxides may be mixed with the raw materials to secure the different popular tints. Rough-faced bricks have come into considerable use as affording a pleasing contrast to the once popular smooth or pressed brick.

In New England brick are commonly made 7¾ x 3¾ x 2¼, which when laid with a quarter inch of mortar, gives walls of 12 or 16 inches. Western brick are more usually

8½ x 4⅛ x 2½, giving a slightly thicker wall, but popular where most of the construction is the length of a single brick or two courses.

Good brick should be uniform in size and color. If a brick is overburned, it is not only darker but smaller and may shrink as much as 3/16ths of an inch. Well-made brick should not absorb more than 1/10th of its weight of water, but some are so porous that they absorb 25 per cent; such are suitable only for filling and should never be exposed to the weather. A first-quality brick should withstand a weight of 1,600 pounds placed on it centrally when the ends are supported under one inch of the length or when laid over a 5¾-inch gap; brick have been made that would bear almost five tons under such a test.

Brick clay consists largely of hydrated silicate of alumina, with iron in varying quantities, and sand or free silica. It varies greatly in adhesiveness, hardness and value. The hand method of working the clay into brick is still used by many small yards in the United States. One or two men can mold and kiln about 50,000 rough bricks in a season, though under favorable conditions they may make considerably more. The clay is usually dug in the autumn and allowed to freeze and thaw until spring, thus disintegrating the mass thoroughly through the action of frost. It is then either spaded until all lumps are removed or put into a horse-power pug-mill, where it is ground up more thoroughly. The mold is simply a box, open at both ends, the size of the brick desired. The protruding clay is planed off with a straight-edge, and the cube of wet clay is then allowed to dry in sheds for some hours before it is placed in a kiln for firing. This latter process usually takes from 10 to 15 days and must be carefully attended to, so that the brick shall not become cooled until the operation is finished. After cooling, stacking and counting, they are ready for the market.

Of the 4,215 concerns in the United States that may properly be termed manufacturers, about 50 per cent use what is known as the «stiff plastic» process. If the material to be worked is of a hard or flinty nature (shale), it is first ground in a «dry-pan,» after which it is raised by means of a cup elevator and passed through a screen to the pug-mill, or mixer, the tailings from the screens being returned to the dry-pan. If the material is sufficiently open, as good brick clay should be, it can be run direct to the pug-mill with little disintegration or grinding. The pug-mill is usually 10 or 12 feet long and contains a series of mixing knives, by which the clay and water are mixed to a proper consistency. From this mixer the clay passes into the brick machine, where it is compressed by a heavy auger into a solid and continuous column, being forced on to the cutting-table through a die of proper size. The cutting is done by fine steel piano-wires on a revolving wheel, working automatically. One of these machines is capable of turning out an average of 100,000 bricks per day. A belt traveling a little faster than the column in moving separates the severed cubes and carries them to the re-press. This latter squares their corners and edges, gives them a smooth, polished surface and imprints upon them any lettering or design desired. The cubes are not put through the re-press unless intended for front or face-brick. The common, rough brick go immediately from the cutting-table to the dryer, which may consist of a series of tunnels built of brick 4 feet wide and 5 feet high by 120 feet long. These tunnels are heated by a furnace underneath, by steam pipes or (in large plants) by a blower which conveys the waste heat from the cooling kiln. The cubes are loaded on little cars and run into these tunnels, where they remain till drawn out at the end of 24 hours thoroughly dried. Each tunnel holds about 5,000 bricks. The bricks are then ready for the kilns, which are of various designs. The down-draft is a favorite modern method of construction. This requires small structures, round, 10 or 12 feet high and 30 feet in diameter, held in place by heavy iron bands to prevent warping from the intense heat. The floors are made of perforated blocks. Superheated air from the furnaces is forced from the top down through the brick piled within, through the floor, and either out through a chimney or into other kilns or dryers. The interior of these kilns under fire is a solid sheet of twisting flame and heat, turning the brick a cherry red, if of common clay. This is kept up for from 6 to 10 days, when the fires are drawn and the mass allowed to cool. The continuous kiln of from 16 to 22 chambers has produced economical results. This stiff plastic method enables the handling of the clay cubes as they leave the cutter without preliminary drying. This and its simplicity make it very popular.

There are three methods of brick manufacture, the «soft-mud» process, «stiff-mud» process and «dry-clay» process. The stiff mud is most widely used, the soft mud almost as extensively and the dry clay claims only a small percentage of the output. Soft-mud brick, being made with a very trifling pressure, are less dense than stiff-mud brick and theoretically seem weaker and less calculated to withstand the weather, but in practice, when well made, they last indefinitely. The stiff-mud brick, though more solid, may contain laminations or planes of separation that weaken them. The soft-mud brick requires more time to dry but is easier to burn. The stiff-mud brick process seems to have a little preference because the bricks are dryer and can go to the kiln more quickly.

About 40 per cent of the manufacturers use the soft-mud process. Clays of a short, sandy nature, or those with a disposition to excessive lamination, are readily treated by the soft-mud process, and beautiful sand-faced brick results. As a rule the Hudson River yards use this system, as well as many in New England and the Middle West. The clay passes first through the separator to free it of lumps, whence it is elevated to the pug-mill compartment of the brick machine. In the pug-chamber it is thoroughly mixed and water added to make it of the proper consistency to mold easily. The machine presses it into wooden molds, which are sanded to prevent adhesion of the clay to the mold, and are removed automatically. They are then placed on a revolving dumping-table, where they are dumped on to pallets, the empty mold being again sanded and passed to the machine for use again. Then the brick goes to the dryer and afterward to the kiln. It takes much longer to make brick by this mold method, but a very fine brick is produced, with a perfectly homogeneous body to it.

Not more than 10 per cent of the manufacturers can or do use the expensive «dry-press» or «dry-clay» method, which takes the finer clays and presses them with a force of 20,000 pounds to the square inch into steel molds. The clay is nearly dry when this is done, so that the cakes can be handled with ease at once. The objection urged by some against this method is that the brick resulting is too porous and apt to absorb moisture, and «sweat» or disintegrate. Still, for the finer clays this method possesses undoubted advantages. The beautiful clays of Staten Island and in portions of New Jersey and Pennsylvania are nearly white, very fine and smooth in texture. These work up into most artistic front and face-brick for the exterior of fine buildings or for decorative mantel and chimney work in the interiors. Hollow brick is much used for partitions. It is made in large sizes and so can be erected very rapidly. It is inexpensive, and since it provides considerable air space is a good non-conductor, thus tending to keep in the heat as well as to keep the cold out of a building. Paving brick, which were once very common, are going into disuse because the concrete pavement is more sightly, more satisfactory and more permanent.

Tiles, being made of the same material as brick, are commonly produced in the same establishments. Tile is really nothing but vitrified or glazed brick. This gives a beautiful surface for interior decoration and a water-resisting surface for roof-tile and sewer-pipes. The United States census classes the brick and tile industry as one, and in the 1910 census lists 4,215 factories. It is probable that there are several thousand more small makers of brick using hand processes who escape notice and are not listed. Those included in the census report give employment to 85,746 people, have an invested capital of $174,673,000, make products valued at $92,776,000, of which $69,040,000 is value added to the materials in course of manufacture. Illinois is the leading State in the brick industry, with 340 factories; Indiana, Iowa, Missouri, Georgia, Kansas, California and Alabama follow in the order named. For further information regarding the uses of brick, see BUILDING MATERIALS; BRICK-MAKING MACHINERY; CLAY-WORKING MACHINERY; MASONRY.

BRICK-LAYING and **BRICK-WORK.** See MASONRY AND BUILDING.

BRICK-MAKING MACHINERY. Machines and structures employed to prepare, mold and dry plastic clay into rectangular blocks of various sizes. These blocks, after being hardened by baking in ovens or kilns, are commercially known as bricks and are extensively used for building and other purposes. For information relative to the sizes, composition, qualities and various uses of bricks, and the general history of brick manufacture, see BRICK. The types of brick-making machines are exceedingly numerous, but they may be conveniently divided into three classes — soft-clay process, stiff, tempered-clay process and dry-clay process. In the soft-clay process (Figs. 1 and 2), which is also known as sand-molding process, clay taken directly from the bank is pulverized, mixed with water and tempered in the machine and then pressed into sanded molds which are fed in beneath the press box. The molds thus filled under pressure are then moved forward to a delivery table, where they are emptied and then returned for refilling. This process makes bricks of a fine homogenous quality but is slow and the machines are, as a rule, used by the smaller manufacturers. Of late years improvements have been made in machines for this process, raising the capacity to 5,000 bricks an hour for each machine, and may be capable of further development.

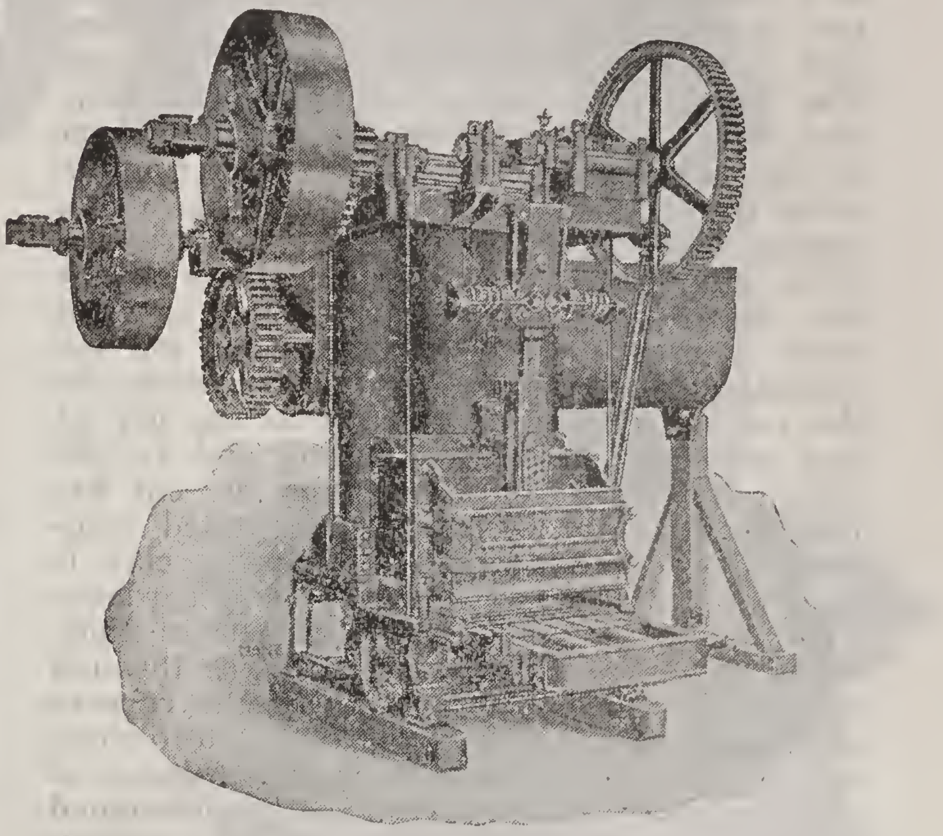


FIG. 2.— Sand Mold, soft mud, Brick Machine with Pug Mill attached.

Die-working machines (stiff, tempered-clay process — Figs. 3 and 4) are of two types— those in which the clay is moved out continuously by means of a rotating auger and those in which the clay is pressed out in bars of specific lengths by the reciprocating motion of a plunger. In machinery for the stiff, tempered-clay process of brick-making, the product of which is, perhaps, that most generally approved by brickmakers, builders, engineers and architects, the bar of clay is cut up into bricks of the required size by wires which, according to the mechanical contrivances adopted to operate them, give to these machines the additional designations end-cut and side-cut or, generally

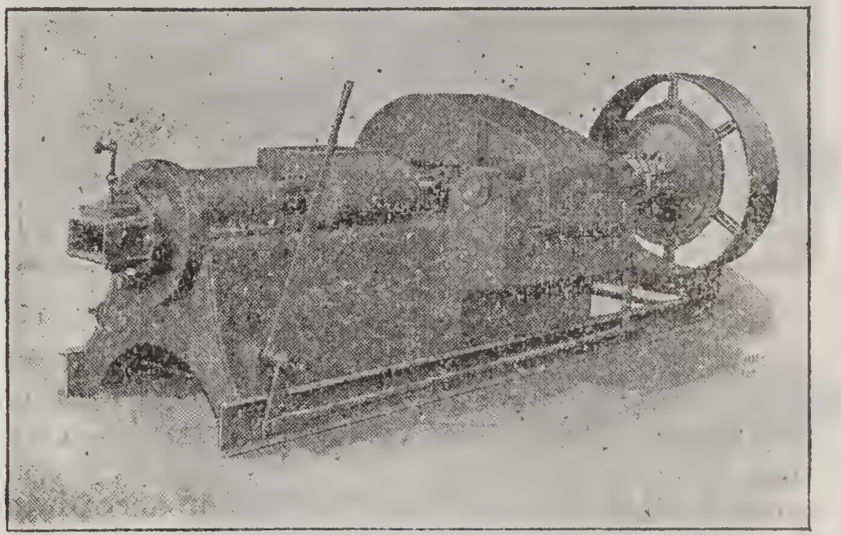


FIG. 4.— Auger Brick Machine.

speaking, wire-cut. The machine for this process is an expressing device for forcing the prepared material through a die (Fig. 6) and forming it in a continuous column to the desired size and shape. The latest types consist of a continuous screw in a case, of such diameter and pitch as will give greatest efficiency, with suitable mechanism for driving the screw. The die is at the end of the screw and adjacent to it, and determines the size and shape of the column of clay which issues continuously from it. In front of the die is located a cutting device (Fig. 5) carrying a series of wires so spaced as to cut up the column of clay into the desired sizes. The spacing of these wires determines the other dimension not determined by the die, and provision is made for the cutting section to move with the bar of clay while in the act of cutting and for its return to starting position after the cut has been made, these cycles being repeated automatically as long as the column of clay is issuing from the die. Since, in accordance with the laws governing the movement of fluids under pressure, the clay as it moves through the die is retarded by friction at the corners and moves more freely at the centre, to obviate this a lubricant is applied to the column at the angles of the die to secure an uninterrupted and uniform flow throughout the cross-section of the bar of clay and ensuring square and well-defined corners to the column.

Of the various devices employed to cut the clay bar, thus formed, into bricks the automatic side-cut wire cutter is probably the best. (Fig. 5). It consists of a regulating frame or table on to which the bar of clay is carried from the die and by which the cut-off is controlled. The belt carrying the bar of clay runs around a measuring wheel which determines the exact thickness to be cut according to the desired size of bricks. The cut-off wires are strained on spring holders to a tension which, while sufficient to cut, yet yields readily to obstructions such as stones, either cutting around them or springing over them, and operate automatically and without any trouble. A broken wire may be replaced at once, generally without stopping the machine.

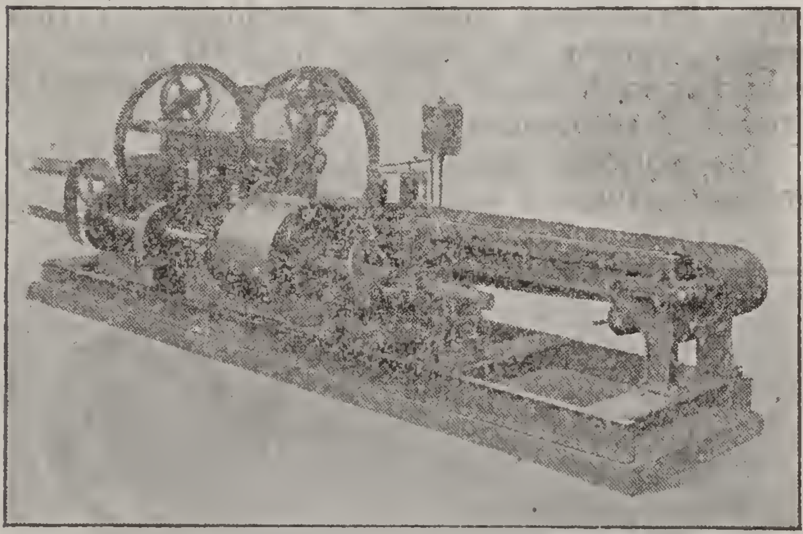
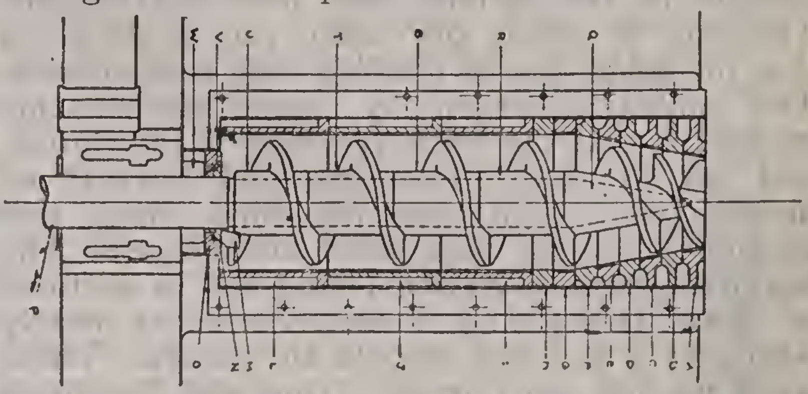


Fig. 5.—Automatic Brick Cutter.

Off-bearing belts are of the endless type and are usually arranged to carry the bricks cut off from the continuous clay bar to any reasonable distance. The bricks are then transferred from this belt to dryer-cars. An auger side-cut machine of this type is capable of an average daily product of 10,000 to 150,000 brick, according to the size of the unit. Its weight complete is from 2½ to 15 tons, and it is equipped with a friction-clutch driving-pulley. Of side-cut devices, the rotary automatic cutter is perhaps the most simple in construction and the most reliable in operation. Its action is entirely automatic and extremely sensitive to regulation. It produces bricks of uniform thickness and smooth angles. All obstructions are pushed from the surface into the body of the bar, thus preventing the ruffled edges common to many side-cut bricks. The measuring section trips the clutch which furnishes the power for operating the cutting mechanism at the proper interval of time and automatically adapts itself to any changes of speed in the movement of the clay bar. The bar of clay is supported on the bottom face and at one side, thus ensuring a smooth, sharp cut. The slit through which the wire passes is just wide enough to accommodate the thickness of the wire used. An auger machine equipped with the side-cut device of the type described has a capacity of from 50,000 to 150,000 bricks per day.



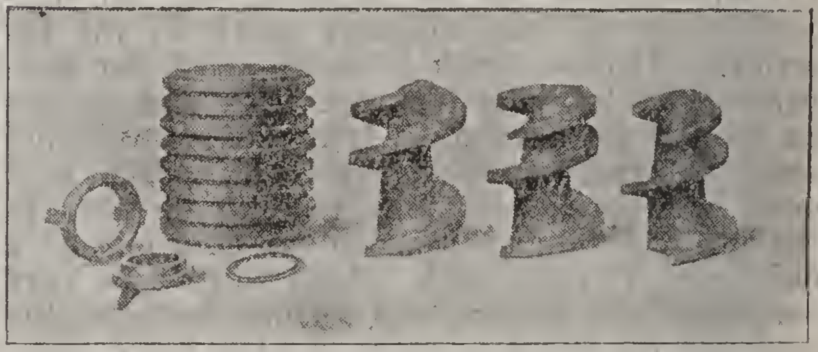


Fig. 8.—Interior detail of Auger Brick Machine, showing Liners, Augers, Etc.

Of the various forms of cutting devices, the board-delivery cutting-table may be described as a general third type. This table cuts 12 bricks at a time, automatically drawing a smooth board under the bricks as they are cut. Cutting-sections of the table travel forward upon a track while the wires are being drawn through the bar of clay, thus compensating for its forward motion, while a slight pressure upon the lever during its return stroke brings the table to its original position and places the board, loaded with bricks, ready for removal. The apparatus weighs about 900 pounds and measures about nine feet in length, including hand-lever in operating position. Modifications of this table are employed for cutting chimney blocks and hollow-ware of large section. To facilitate the handling of bricks in their green condition and to prepare them for the drying and burning processes, various appliances are employed which ensure more or less economy in time and labor.

Repressing is a process employed to produce bricks suitable for fronts of buildings,

BRICK MAKING MACHINERY

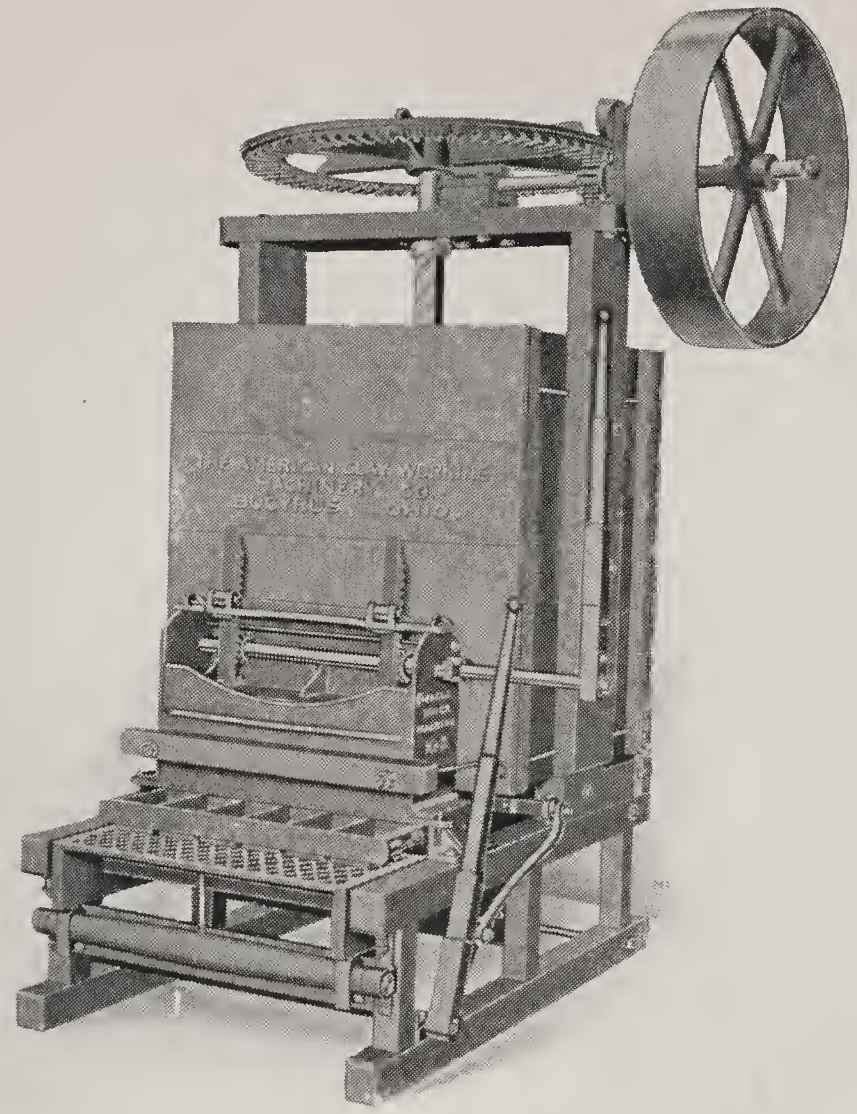


Fig. 1 Sand Mold Brick Machine

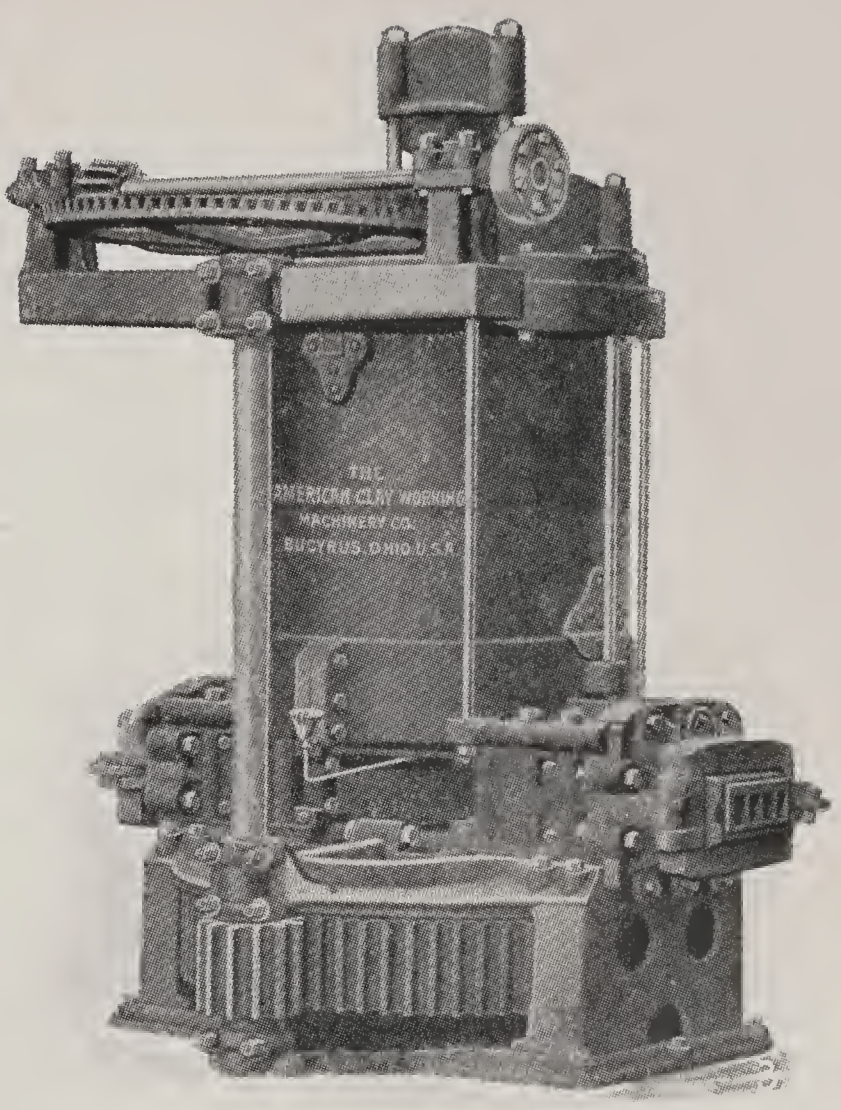


Fig 3 Plunger Type of Brick Machine

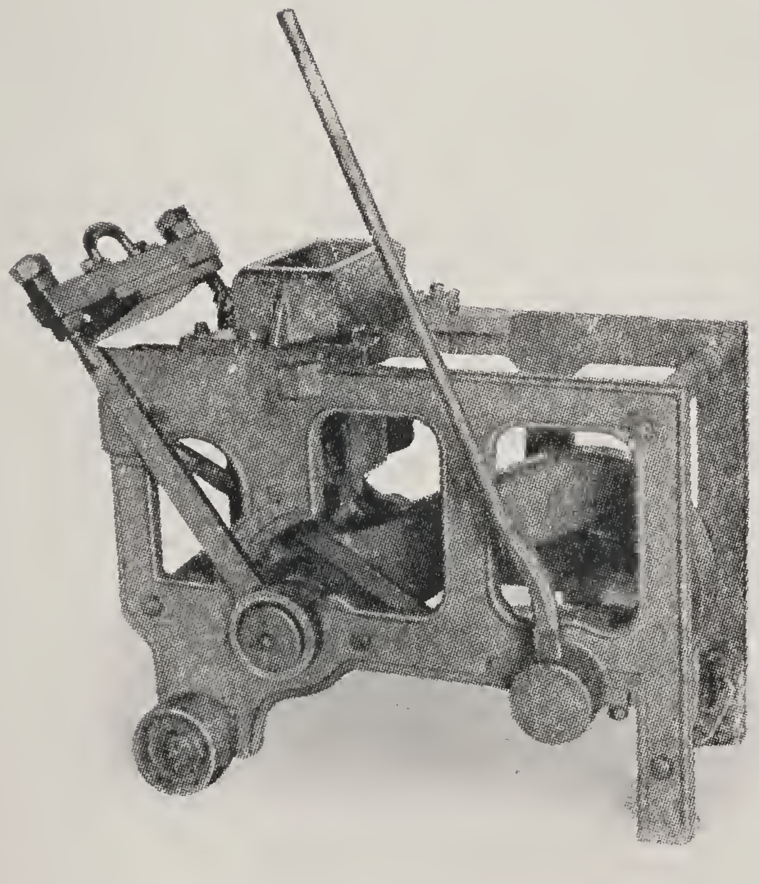


Fig. 6 Hand Power Brick Repress

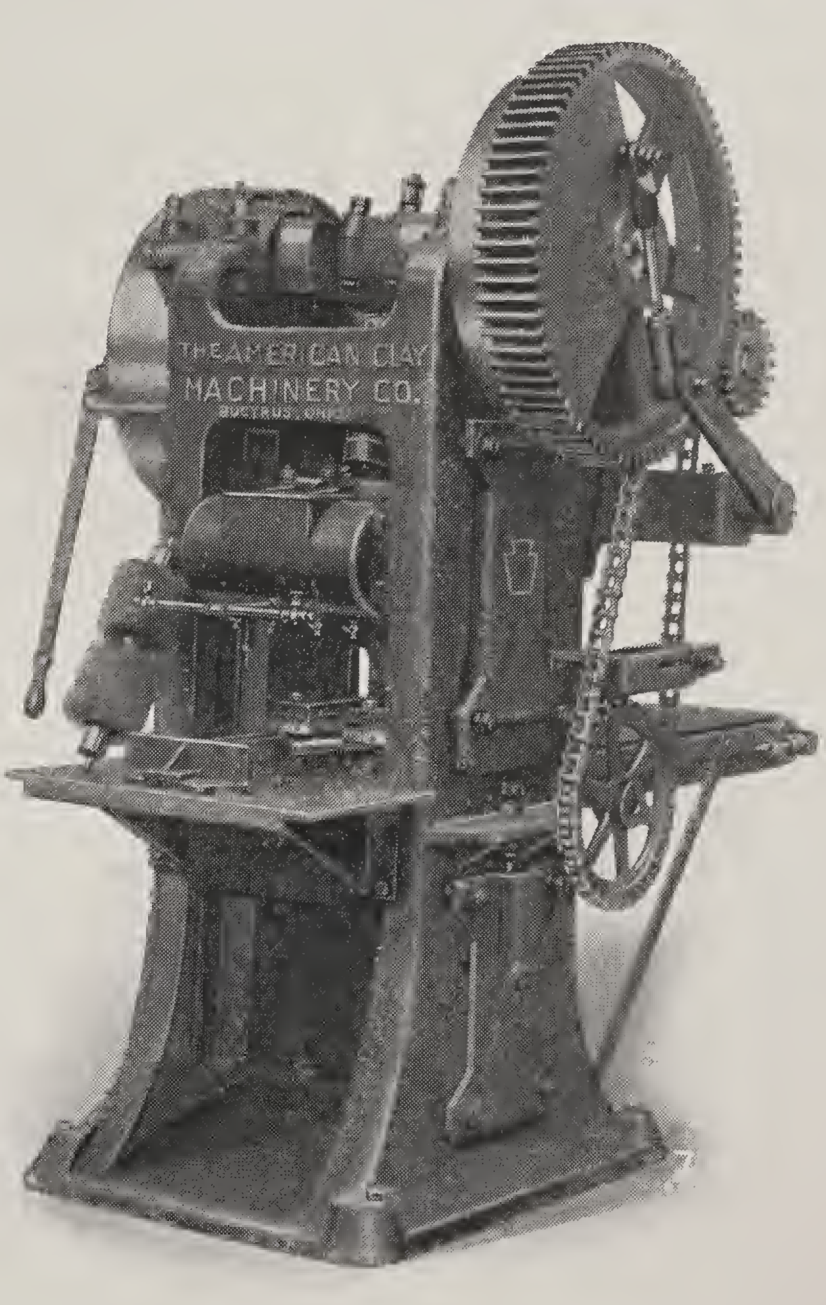
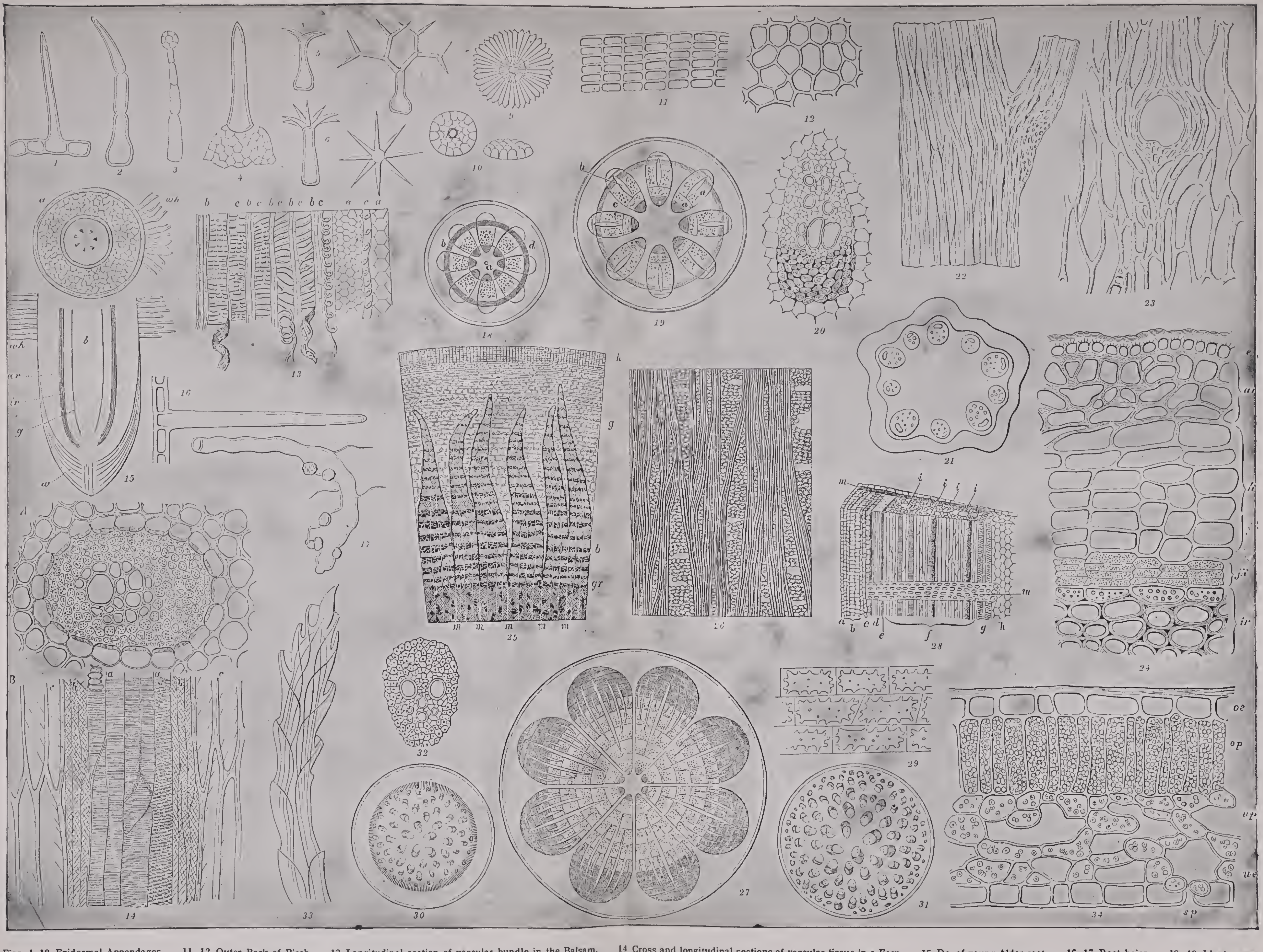


Fig. 7 Power Brick Repress

BOTANY — STEM-STRUCTURE, ETC.



Figs. 1–10 Epidermal Appendages 11, 12 Outer Bark of Birch 13 Longitudinal section of vascular bundle in the Balsam. 14 Cross and longitudinal sections of vascular tissue in a Fern 15 Do. of young Alder root 16, 17 Root-hairs 18, 19 Ideal cross section of a Dicotyledonous stem 20 Cross section of a vascular bundle in do. 21 Cross section of stem of Clematis 22, 23 Network of Vessels from stem of Sow-thistle 24 Cross section of Black Currant Bark 25, 26 Cross and longitudinal sections of liber in Lime-tree 27 Ideal section of a Dicotyledonous stem 28 Ideal structure of Exogenous stem 29 Medullary ray of Oak 30, 31 Ideal cross section of Endogenous stem 32 Cross section of a Monocotyledonous vascular bundle 33 Longitudinal section of Root stock of Iris 34 Vertical section of Beech leaf

ornamental tablets and corner-pieces with designs in relief, or intaglio, and other shapes of any desired design; also paving brick and blocks, fire-clay brick, blocks and tile. The great many varieties of machines used for this purpose are called represses and are operated either by steam or hand power. The hand press shown in Fig. 6 is equipped with a very powerful operating lever and has a steel-lined box with a top plate and plunger faced with steel, conveniently arranged for refitting whenever necessary. It weighs about 900 pounds, occupies floor space 20 inches by 3 feet 6 inches, exclusive of the lever, and may be readily moved upon the rollers under the forward end from place to place about the works. Power represses are made with one or two sets of plungers or pressure plates.

For repressing paving brick, fire brick and face brick by power (Fig. 7), a power-operated machine is employed, covering various sizes of ware. For repressing face and fire brick a capacity of 18,000 to 20,000 bricks daily is the average. When repressing paving brick with round corners that will stand rapid handling, the presses may be speeded so as to obtain an average of 30,000 daily from each machine. The larger size machines are for larger ware, which must be handled more slowly, hence the daily output in number of pieces is less in proportion to the size and shape of the ware.

One of the most marked improvements in brick-making is the invention and introduction of the mechanical brick-setter, which takes the brick from the dryer-car and sets them in the burning kiln. (Figs. 14 and 15). This work had always been done by hand until the introduction of the Penfield setting system in the larger yards of the country. Hand-set brick was a slow task. A setting gang was composed of tossers, who took the brick from the car and tossed them, four at a time, to the setters, who placed them in the kiln. The speed was limited to 10,000 brick per man per day and many brick were damaged by careless handling. The Penfield setting system handles an entire dry-car load of brick at a time without damage. A thousand brick a minute can be handled by this mechanical device. The use of the mechanical brick-setter does not interfere in any way with any other department of the plant. The brick are taken from the off-bearing belt and are hacked on dry-cars just as of old, except that each car is hacked on a standard plan as a kiln unit, leaving a small space between the bricks of the bottom row to provide an entering space for the arms of the setting machine. Each dry-car is loaded with 800 to 1,000 brick, which are called a unit. The setting machine handles a full carload of brick at each lift, touching only the bottom rows and doing the work without dropping, chipping or injuring the brick. The preparation necessary for the installation of the Penfield setting system in the plant is to equip the kiln shed with an overhead electric crane. The tracks upon which this crane runs should be built through the entire length of the kiln shed, or as much of it as is desired for machine-set brick, in order that the setting machine may operate freely over the top of the kiln. To this overhead crane the brick-setting machine is attached. The setting machine is built throughout of steel and has a number of prehensile arms which enter the spaces left between the bottom rows of brick as hacked on the dry-cars. Each stack or carload having been built on a uniform plan, it is easy for the operator of the crane to run the carrier up to the dry-car and the arms of the carrier enter the spaces left to receive them. The crane then starts to raise the load, and the weight of the load on the carrier causes a series of grip-plates on the arms of the carrier to close automatically, putting just sufficient pressure on the bottom rows of brick to hold them firmly. The bulk of the weight of the load is carried by the heavy steel arms, as the third course of brick from the bottom is built crossways of the arms. The lower row of brick having been automatically clamped, the load is raised and is successfully carried to any part of the kiln, where it is set accurately in any position desired on any bench of the kiln. When the load has been lowered into position in the kiln and the weight is no longer on the machine, the pressure is automatically released from the grip-plates and they release their hold on the bottom rows of brick so that the craneman can back the carrier out from under the load and return with the carrier to the dry-cars for another lift.

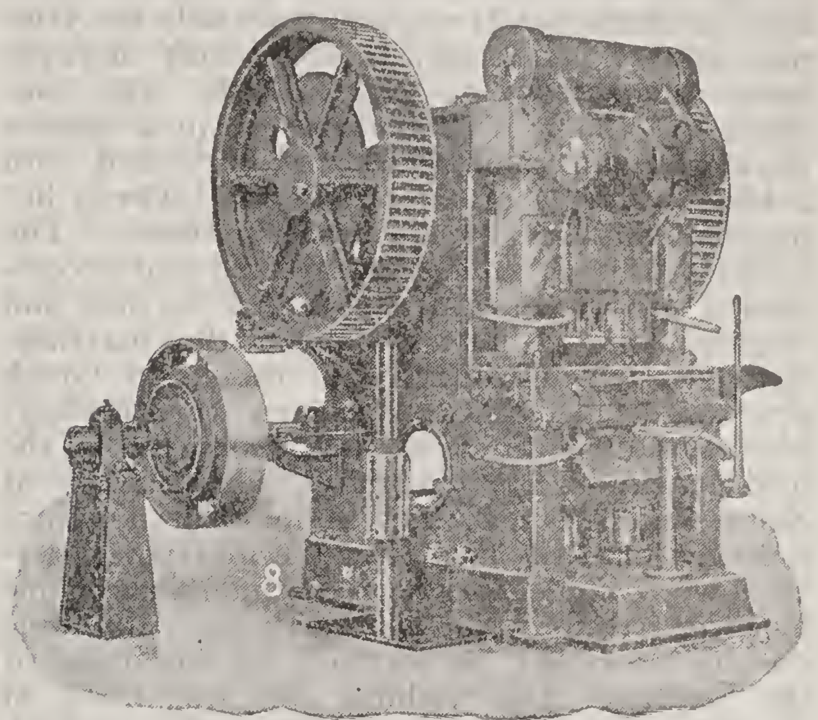


FIG. 9.— Dry Press Brick Machine.

In addition to brick being made by the soft-mud process and the stiff-mud process, both of which have been described, they are also made by the dry-press process, by which the clay is ground to a powder and pressed in practically a dry condition. This machine is shown in Fig. 9.

DAVIS BROWN,
The American Clay Machinery Company.

BRICKS WITHOUT STRAW, a novel by Albion W. Tourgée, containing a modern application of the Biblical phrase. The words are an allusion to the darkest days of the Hebrew bondage in Egypt, when the toilers were ordered to furnish their own straw without diminishing the number of bricks produced in a given time.

BRIDAL WREATH. A deciduous shrub, very popular in temperate countries. See SPIRÆA.

BRIDE, Saint. See BRIDGET.

BRIDE OF ABYDOS, The, a poem by Lord Byron, published in 1813. From this a melodrama was adopted a few years later by Dimond.

BRIDE AND BRIDEGROOM, words of Anglo-Saxon origin applied from very early times to a newly-married wife and husband, the more common form at present being bride and groom. It has been usual from the earliest period of antiquity to pay especial honors to a bride and groom, and in every age and among every people the wedding-day has been devoted to joyous and solemn ceremonies. It was celebrated among the Athenians by offerings made in the morning to particular divinities, to Zeus and Hera, and especially to Artemis, who was thought to look with disfavor upon marriages. At nightfall she was conducted to the bridegroom's house in a chariot drawn by a pair of mules and furnished with a kind of couch, on which she sat between her husband and one of his nearest friends. The bridal processon moved on, greeted and accompanied by friends bearing nuptial torches and singing songs. Then followed the marriage feast, to which, contrary to the usual Greek practice, women as well as men were invited; and at its close the bride was conducted by the bridegroom to her apartment, where a law of Solon required that they should eat a quince together. On the day after the marriage, presents were made to the newly-married couple by their friends. Among the Romans the same custom prevailed, in memory of the rape of the Sabines. The wedding day was fixed, at least in early times, by consulting the auspices. The Roman marriage was usually, though not always, unattended by religious rites. The bride was conducted to the house of the bridegroom by a procession and bore in her own hands the emblems of diligence, a distaff and a spindle with wool. The bridegroom received her within with fire and water, a symbol, perhaps, of purification, and the ceremonies of the day were concluded by a repast given to friends and relatives. The bridal apartment, to which she was conducted by matrons who had not had more than one husband, was magnificently decked with flowers, and minstrels and friends sang without during the night.

In the days of our ancestors various ceremonies, often «more honored in the breach than the observance,» were followed. The bride was undressed and put to bed by the bridemaids, and the bridegroom submitted to the same operation at the hands of the groomsmen. Then the posset, a drink made of milk, wine, yolks of eggs, sugar, cinnamon and nutmeg, had to be served. Then there was sometimes another dilatory proceeding in the sewing of the bride in a sheet. The arraying of the bride in white, the wedding feast and the giving of presents are ancient customs. As early as the time of James I, the presents received by the bride of Sir Philip Herbert amounted in value to $12,500, a notable expenditure of the kind for those days, but frequently surpassed at the present time by the value of a single bridal gift. The bridal kiss is of unknown antiquity. The old missals, which date long before the «common prayer book,» enjoined it as an essential part of the marriage ceremony. Moreover, it was always done in church. The priest, too, at one time enjoyed the privilege of kissing the bride. Groomsmen claimed and took it for a long period. The ordinary accessories of the weddings of our days may mostly be traced to ancient times. The marriage ring probably encircled the finger of the wife of the first Pharaoh, and was certainly used in the Roman ceremonies under the emperors. Its heathen origin nearly led to its abolition by the Puritans of Cromwell's time. The wedding ring is always put and worn on the fourth finger of the left hand, because it was supposed in ancient times that an artery ran from this part directly to the heart. The bride-cake is no less sanctified by antiquity than the ring. It is a symbol of plenty, and is intended to express the hope that the newly married pair may be always supplied with an abundance of the good things of this life. In ancient days wheat was sprinkled upon the head of the bride with the same intent. At present this custom is superseded by the scattering of rice upon the bride and groom as they leave the house after the reception. The throwing of an old shoe after the couple shows traces of an old superstition. Passing bits of the cake through the wedding ring nine times, and putting them under the pillow to dream upon, was a practice in vogue long before our great-grandmothers lived and loved. Putting up the slices in white paper boxes is an innovation of later times. Wine was an invariable accompaniment of all marriages, long before the marriage feast at Cana. In times past it was customary to drink it in the church, the priest having first blessed the cup, however, to suit it to the holiness of the place. The Jews universally hold to the custom of wine-drinking on the occasion of a marriage. After the bride and groom have drunk from the glass it is broken to remind them of mortality.

Modern custom lengthens out the privileges of bride and bridegroom beyond the wedding day. In former times, when the religious ceremony and the attendant festivities were over, all bridal honors ceased. These are now prolonged by the bridal tour. The term honeymoon, formerly applied to the first month of married life, is now more vaguely used and is sometimes given to the entire period of the bridal tour, even when that is extended over many weeks.

BRIDE OF LAMMERMOOR, The, by Sir Walter Scott, one of the group of 'Waverley Novels' called 'Tales of my Landlord.' The scene is laid on the east coast of Scotland, in the year 1700. The hero is Edgar, Master of Ravenswood, a young man of noble family, penniless and proud. He has vowed vengeance against the present owner of the Ravenswood estates, Sir William Ashton, lord keeper, whom he considers guilty of fraud; but forgoes his plans on falling in love with Lucy, Sir William's daughter. There is a secret betrothal; the ambitious Lady Ashton endeavors to force her daughter to marry another suitor; and in the struggle Lucy goes mad, and Ravenswood, thinking himself rejected, comes to an untimely end. The most famous character in the book is the amusing Caleb Balderstone, the devoted old steward of Ravenswood, who endeavors constantly to save the family honor and to conceal his master's poverty by ingenious devices and lies, and whose name has become the symbol of «the constant service of the antique world.» Though sombre and depressing, the ‘Bride of Lammermoor’ is very popular, and the plot has been used by Donizetti in the opera ‘Lucia di Lammermoor.’ Consult *London Monthly Review* (Vol. XXXIX, p. 387).

BRIDEWELL. The name originally belonged to a well dedicated to Saint Bride between Fleet street and the Thames, which has given its name successively to a palace, parish and house of correction. Henry VIII built on this site, in 1522, a palace for the accommodation of the Emperor Charles V, which became a residence of Wolsey. Under Edward VI it was, in 1553, converted into a workhouse for the poor, and a house of correction for the idle and vicious. From this originated the generic term, «a bridwell» — a house of correction. It was governed by a keeper who was independent of the sheriff of London. Queen Mary confirmed the gift, and it was formally taken possssion of by the lord mayor in 1555. It at last became a place of punishment until its removal in 1864.

BRIDGE, a game of cards of the whist family. It is similar to the Turkish and Egyptian «Khedive»; to a Danish game of the middle 19th century; and to the «Dutch whist» played in London in 1884. The Russian variety, «Yeralash» or «Biritch» was accepted by the London clubs in 1894 as «Russian whist» or «Biritch» and corruption of the Russian word to «bridge» followed. As «Bridge Whist» the game rapidly replaced whist. In 1904 «Auction bridge» was suggested but was not taken up until 1907, when it was adopted by the Bath Club and quickly superseded Bridge whist.

Auction Bridge.— The outstanding characteristic of Auction is the determination of the trump or no-trump declaration by bidding. There are four players, forming two sets of partners, and the ordinary pack of 52 cards is used, the cards ranking from ace to two, with the ten lower than the knave. The entire pack is dealt, singly and to the left; the game is played with trumps or no-trumps, and the bidding continues until three players «pass.» The dealer has the first bid, but is not compelled to bid, and if all four players «pass» the deal passes to the next player. The bid is for the number of tricks above six the bidder contracts to take. Any bid may be «doubled» by any player — doubling its value in points if won, and doubling the penalty if the bidder loses — and the original bidder may «redouble,» quadrupling the first values. Doubling and redoubling may occur at any stage in the bidding, without affecting the value of the bids themselves or deterring further bidding. The trump or no-trump declaration passes to the highest bidder, known as the declarer, and the player on his left leads. The declarer's partner then places his cards on the table, face upwards, and takes no further part in the play, except that he may call attention to an improper play, to an error in the score, question his partner as to a «revoke» — renounced suit — and participate in any discussion of the play or the score. The declarer plays his own and his partner's hand, as in dummy whist, and the play is the same as in whist (q.v.). The value of the different suits, as fixed by the Whist Club of New York, November 1913, is as follows: Clubs, six; diamonds, seven; hearts, eight; spades, nine; no-trumps, 10. «Honors» are credited to the original holders and constitute the five highest cards in trumps, and the four aces in no-trumps; their value is rated by the trump suit and is not altered by doubling. Three honors between partners count twice the value of a trick in that trump; four honors, three tricks; five honors, four tricks; four honors in one hand, eight tricks; four honors in one hand and the fifth in a partner's hand, nine tricks; five honors in one hand, 10 tricks. In no-trumps three aces between partners count 30; four aces count 40; and four aces in one hand count 100. The Grand Slam — taking all 13 tricks — counts 100; the Little Slam, 50; and winning the rubber — two games out of three — counts 250. The score is kept on paper and «game» and «honor» points are kept separately. The game is for 30 points and all over six tricks count towards it. Only the declarer and his partner score towards the game, the penalties awarded the adversaries when the declarer loses being credited in the «honors» column. When the declarer loses, the adversaries score 50 points for each extra trick he contracted to take, 100 for each doubled extra trick, and 200 for each redoubled extra trick. When the declarer wins in spite of double he scores 50 points for filling his contract and 50 for each extra trick; if he redoubled, 100 points for his contract and 100 for each extra trick. After the rubber is played honor and game scores are added and the difference between the scores of the two sets of partners is the number of points won. In scoring the points won in excess of those necessary to win the game count towards the score, but not towards the next game. All hands must be played out; but if two games in succession are won by one set of partners the rubber is then complete.

«Nullos» are not officially recognized, but when played they are valued at eight points, outranked by hearts; the bidder undertakes to force his adversaries to take a certain number of tricks over six. A revoke is penalized by 100 points for each offense if against the adversaries; and by 100 points, or three tricks, if against the declarer, but for a second or third offense in the same deal the declarer must take points only. Such tricks count toward contract, but do not carry bonus in case the contract had been doubled.

Bridge Whist.— Bridge differs from Auction chiefly in that the making of the trump or no-trump declaration rests with the dealer and may be passed to his partner but not to the adversaries. This was a signal departure from whist, in which the trump was the last card turned. The value of the suits also was a departure from whist. They are: Spades, two; clubs, four; diamonds, six; hearts, eight and no-trumps, 12. The Grand Slam counts 40; the Little Slam, 20. If a player possesses no card of the trump suit he makes «Chicane,» which counts twice the value of a trick in the trump suit. Doubling and redoubling may take place after the trump is declared. The rubber counts 100 and honor values are determined by that of the trumps. The reckoning of the score is the same as in Auction. Consult Dalton, W., ‘Complete Bridge’ (1906); Foster, R. F., ‘Bridge Manual’ (1907); Work, M. C. ‘Auction of To-Day’ (1913) and ‘Auction Developments’ (1913), ‘Foster on Bridge’ (1919).

BRIDGE. In its broadest sense, the term signifies any kind of an independent connecting structure. Specifically, it designates a structure erected for the purpose of continuing a roadway over a stream, valley or any other natural or artificial obstruction without closing the way beneath as with an embankment.

The origin of the term is difficult to trace, and the art of bridge-building itself is so ancient, that its beginning lies in the efforts of primitive man who felled trees, or swung jungle vines across the streams to facilitate his movements on his hunting trips, or when engaged in trade or travel from village to village.

The construction of a bridge, however, as an engineering structure, although quite elemental in its engineering features, may be traced back more or less accurately to the Chinese who appear to have been the first people to employ the masonry arch for the purpose of continuing roadways across streams.

The art of bridge-building, however, as developed in the various countries was not evolved from the earlier Chinese practice, but independent effort characterizes its development in each country, and by the very nature of the structures built in the past, the present-day investigator is enabled to formulate very clear and accurate ideas as to the character, customs and importance of the peoples who built them.

Whether the Egyptians were bridge-builders is conjectural for no bridges have survived among the structures of their ancient civilization. Some brick arches of crude construction have been found in ruins along the Nile, ascribed to the period 2900 B.C. It is not known that they were bridge arches. Similar conditions appear to have obtained among the Babylonians and the Assyrians, and the earliest examples that remain, other than those of the Chinese, appear to belong to the «Hittite» and «Pelasgic» tribes, who inhabited the shores of the Mediterranean Sea during a prehistoric period antedating that of the building of Troy. Their engineering methods appear to have been imitated by the Cretans, whose cities in Asia Minor, Greece and Italy, and in the countries bordering on the Mediterranean, were connected by macadamized roads which required bridges that were constructed by a high order of engineering skill. They were somewhat similar to the one built about 425 B.C. across the Euripus in Eubœa, a province of Greece, and consisted of massive abutments and piers of masonry with a connecting superstructure of planks. The typical Greek method is shown by the bridge at Assos, in which parallel stone lintels doweled together are employed to connect the piers and abutments.

On the other hand, the engineering genius of the «Pelasgic» tribes was inherited and developed by the Etruscans and the Romans in the application of the basic principles of the arch.

The bridges at Vulci, Bieda and Cora, in Italy, were not true arches, the stone courses having been corbeled out to meet at the centres of the spans. These were built during the 7th and 6th centuries B.C. The true Roman semi-circular arch did not appear for another century. From that time onward the Roman bridge-building methods were carried through stages of greater and greater excellence until the 4th century B.C., when the Roman policy of constructing great military roads to bind their possessions together permitted the highest development of their engineering skill, in structures of this kind.

The brilliant and unrivalled career of bridge and viaduct construction thus inaugurated by the building of the famous Via Appia, and culminating in the erection of the eight great bridges of Rome, has furnished models for all the succeeding centuries, and is applicable to-day to the construction of stone structures.

Some of the bridges of the Republican period still remain. Of these, the Ponte Lupo and the viaduct for the Anio Vetus aqueduct were built about 143 B.C., and consists of great stone arches of tufa and travertine; while the viaduct near Gabii, built about 122 B.C., consisting of seven arches about 292 feet long, is still in use. Within Rome itself, the Æmilian bridge, built in 179–142 B.C. across the Tiber, is supposed to have been the first stone bridge to span that stream, all the others having been constructed of wood, a material which continued in use until quite a late period for bridges across wide rivers. Another, the Sublician Bridge built 621 B.C. by Ancus Martius across the Tiber between the Janiculum and the Aventine Mountain was famous for its defense by Horatius Cocles against the great army under Lars Porsenna. The only one of the urban bridges of Rome that remains intact is the Fabrician Bridge, or «Ponte Fabricio,» built in 62 B.C., but the greater part of the most magnificent of them all, the Ælian Bridge, or «Ponte Sant' Angelo,» built by Hadrian in 136 A.D., also remains. The former consists of two round Roman arches of 80 feet span built of peperino and tufa, faced with massive blocks of travertine; the latter of eight arches, arranged to grade upward toward the centre of the structure, thus adding greatly to its architectural effect.

Of the important bridges built on the great military roads of the Empire — the Appia, the Aurelia, the Flaminia, the Via Salaria or Ponte Salaro, the Cassia, the Valeria, the Latina and the Æmilia, those built during the Augustan period were the most remarkable. The Flaminia commenced at the Mulvian Bridge and ended at the Ariminium (Rimini) Bridge. The latter, which consists of five great arches with a total length of 236 feet, is the best preserved of them all; but vestiges of a great many others still remain, the most important being those near Narni and Borghetto, the great one of Vincenza, rebuilt at Verona, and those near Aosta and Calzi.

With the expansion of the empire many bridges were built upon the fine macadamized roads which connected the various provinces with the Eternal City, by the Roman legions under the direction of their skilful military engineers. Of these, the greatest was the bridge across the Danube, built in 103 A.D., by the engineer Apollodorus, to enable the Emperor Trajan to conquer Dacia. It consisted of 20 massive stone piers, 60 feet square, connected together by a superstructure of wood with arches of 170 feet span. It had a height of 150 feet and a total length of 4,770 feet. It was subsequently destroyed by Hadrian, but the great piers are still standing. They were built in caissons in 18 feet of water, and illustrate effectively the consummate daring of the Roman engineer.

Prior to its construction, intervals of such enormous length had been spanned by temporary bridges of boats, a practice handed down from a period reaching farther back than that of Xerxes, Darius, Hytarpus or Cyrus — in the 6th century B.C. It is interesting to note in this connection, however, that the most celebrated bridges built by the Romans were not generally distinguished for the great span of their arches, their great total length or the peculiar lightness of their piers, but for their excellence of construction, and durability. The span of their arches seldom exceeded 70 or 80 feet, and their height was nearly half the span, thus giving the arches a semi-circular form, or, more exactly, a segment of that form.

In all the countries which formed the provinces of the Roman empire, with the exception of the Spanish Peninsula, most of the bridges built by the Romans were allowed to fall to pieces during the Dark Ages, so that very few of them have survived. The ruins and foundations of some still exist near Vaison, and Chateau Neuf, in France, but are not of sufficient size to convey much of an idea of the special characteristics of the structures. In Spain, however, the high culture of the Moors ensured the preservation of these superb examples of Roman engineering. Of these, the best examples are the bridges at Cuenca, Evora, Martorell, Merida, Chaves, Alconetar, Orense, Olloniego, Almazan, Ona and Salamanca. The greater number of them were built by Trajan, and that of Salamanca is the most magnificent of all. Many of these structures were adorned by triumphal and memorial arches at each end, or in the centre, which, while adding greatly to their architectural effectiveness, also served the purpose of a toll gate, or a fortification. Interesting examples of these are the bridges at Saint Chamas, in France, and the Ponte Salaro at Rome.

The Moors not only preserved the Roman structures, but imitated them and built many bridges fully their equals in size and elaborateness of design. The bridge at Cordova, across the Guadalquivir, is of 16 spans and is one of the most notable examples of their work, and also that of Alcantara, across the Tagus, built by Lacer during the reign of Trajan. It consists of six granite arches, the largest, 115 feet span. It has a total length of 600 feet, with a width of 26 feet, and carries the roadway at a height of 45 feet above the level of the river.

The early history of Oriental bridge-building appears to extend back to the days and works of Semiramis, who is credited by Diodorus Siculus with the construction of a bridge across the Euphrates at Babylon about 776 B.C., and is described by him as a movable drawbridge, 30 feet wide, supported by stone piers.

The earliest existing examples of Oriental work, however, appear to be the Persian bridges at Dizfel 1,250 feet long, and at Shuster 1,700 feet long, which were probably built during the rule of the later Achæminid Kings over Iran, about 350 B.C. Their design embodies the flat-pointed arch characteristic of later Mohammedan architecture, and they are still in a fair state of preservation.

It is noteworthy, that, while the culture and continuity of the Byzantine and Mohammedan civilizations maintained in good condition the bridges already built, and created new ones of equal usefulness and magnitude, the science and art of bridge-building was practically lost in the European countries during the six centuries (500–1100 A.D.) which comprised the Dark Ages. In the 12th century, however, the architectural and engineering sciences felt the awakening impulses which culminated in the magnificent structural creations of the Renaissance. The revival was first experienced in Italy and France. Bridges were built not only by the governing authorities but also by the churches — the building of a bridge being considered in the nature of a pious undertaking by a religious order of the Benedictines, known as the «Brethren of the Bridge.» Bridges were built at Tours, Orleans and Vienna, and many other large cities, and the Rhone was spanned at Lyons and Avignon by two fine bridges, the last named being about 3,000 feet in length. It was built during the years 1178–88, by Benezet. It is remarkable on account of the elliptical curvature of the arches, the radius of which is shorter at the crown than at the haunch, and, therefore, conforms more nearly to the linear equilibrated arch, than the modern elliptical arch which has the longer radius at the crown. It consisted of 19 arches. The span of the largest arch was 110 feet 9 inches with a height of 45 feet 10 inches. Four of the arches still remain.

The bridges built in southern France were particularly fine. The bridge at Espalion is regarded as the oldest — built in 780 — and it was probably the first with the pointed arch. The Saint Esprit, the Beziers, the Montauban and the Pont Valentré, over the Lot at Cahors, are some of the best examples of those built during the period covered by the later part of the 13th and the earlier part of the 14th centuries. The application of the system of end and central towers for purposes of fortifications received the highest development at this time. This was especially true in France where the mediæval social conditions made such fortifications an absolute necessity. In this respect, Germany and Spain were far behind France, although the monumental bridge of 15 semi-circular arches across the Danube at Ratisbon, built by the Germans in 1135, and the bridge of 18 semi-circular arches across the Elbe at Dresden, were very fine examples of this kind. The Spanish bridges at Zamora, Tudela, Lograno, and Palencia, built during the period 1135 to 1192, are of the pointed arch type, some of them consisting of as many as 20 arches.

Of the Italian bridges built during this period, the best examples are the Ponte Vecchio in Florence, originally built in 1177 and rebuilt in 1362, the bridge at Mantua, and the Rialto Bridge over the Grand Canal in Venice, built in 1588. These bridges were of the covered type, that is, they had a covered gallery which was flanked by a double line of booths and small shops in which all kinds of merchandise were exposed for sale. In Italy, the use of wood as a material of construction was generally adhered to until the 13th century, although in France, and in the other countries of northern Europe it had been generally supplanted by masonry. Yet, at the close of the 15th century, Italy had some fine stone structures —

the bridges at Mossa and Signa in Tuscany, and the Ponte del Diavolo near Lucca, with one span of 120 feet; while France had many large wooden bridges at several important points.

The engineers of the Renaissance returned to the round arch typical of the Roman bridges, but they showed great boldness in their designs, by increasing the span of the arches. The bridge across the Adda at Trezzo, built under the orders of Bernabo Visconti, Duke of Milan, during the latter part of the 14th century, consisted of a single arch of granite with a span of 251 feet, and a radius of 133 feet, while the bridge over the Ticino at Pavia consisted of seven pointed arches of brick work, each 70 feet in span and 64 feet rise.

Of the smaller Italian bridges, the most famous is the Bridge of Sighs at Venice, built during the latter part of the 16th century, to connect the Ducal Palace with the prison.

In England, the use of stone as a material of bridge construction dates back to the bridge over the East Dart at Dartmoor, believed to be over 2,000 years old. A stone bridge at Bow over the river Lea is the earliest English bridge of that type of which there are records. It was built about 1110. An old bridge over the Thames was in existence in 978, and in some records of 1014 there is mention of another. By existing records it appears that a triangular pointed arch stone bridge at Croyland, Lincolnshire, was chartered in 943. The present structure, known as the Croyland Bridge, however, although one of the oldest stone bridges in England, appears to have been built about the latter part of the 14th century. It is also triangular in form, and consists of three pointed arches which span the waters of the Welland, the Nyne and the Catwater drain. On account of its steep grade it can be used only by foot passengers.

The work of the «Brethren of the Bridge» order carried the art of bridge-building up to the 17th century, and a great many fine structures were built in all parts of Europe. In France, the most important were the Trilpot, Tours, Gignac, Neuilly and Blois bridges, and in England, the Blackfriars, Westminster, Winston and Kelso. The date of the building of the first London bridge across the Thames is quite uncertain; but, there is very little doubt that it was built of timber and had to be frequently reconstructed. The so-called great London Bridge was built of stone, between the years 1176 and 1209, by an architect sent from France for that purpose. It had a covered gallery which was lined on both sides by shops, like a regular street. It consisted of 19 or 20 pointed arches, varying from 20 feet to 9 feet in span, and had a total length of 940 feet. It was supplanted by the structure now known as «Old London Bridge,» in 1831. This structure consists of five elliptical arches, of which the centre arch has a span of 152 feet, with a height of 29½ feet above high-water mark. The two next are 140 feet, and the two shore arches 130 feet in span, with a height of 27½ feet. The total length of the structure is 1,005 feet, and it carries a roadway 53 feet wide between the parapets. The Blackfriars Bridge across the Thames was built between the years 1760 and 1768. It comprised nine elliptical arches. The central arch had a span of 100 feet, and the others decreased gradually from 98 feet in those next to the centre, to 70 feet in those at the ends. This bridge was replaced in 1865 by a cast-iron bridge of five spans. The Westminster Bridge was built between the years 1738 and 1750. It consists of 15 semi-circular arches, of which the centre arch is 76 feet in span, and the span of the others decreases at the rate of four feet for each succeeding arch, except the two shore arches, each of which has a span of 25 feet. It is 1,164 feet long. Other notable English stone bridges built during the 18th century are the Winston Bridge over the river Tees, and the Kelso Bridge over the Tweed. The former has a superb arch 109 feet in span, while the latter consists of five arches, each of which are 72 feet in span. Perhaps the most notable stone arch bridge built in any country during the 18th century is the Pont-y-Prydd, across the river Taff in Wales. It was built by William Edwards, a clergyman, afterward a stone mason, in 1750, after two failures due to excessive weight of the haunches, which in the third and successful attempt were lightened by the introduction of pierced spandrels. It consists of a segmented arch 150 feet in span, with a height of 35 feet, and its most curious feature is the gradual increase of its width by offsets, from 14½ feet at the crown of the arch to 16 feet at the abutments.

The most remarkable bridges constructed in France during the 18th century were the work of the famous Department of Ponts et Chaussees, established in 1715. The best examples of their work are the Blois Bridge over the Loire, the construction of which was commenced in 1720, and which consists of 11 elliptical arches, ranging from about 55 feet to 68 feet in span; the bridge over the Loire at Tours, the construction of which was commenced in 1755, and which consists of 15 elliptical arches, each 80 feet in span, and separated by piers 16 feet thick; the Trilport Bridge over the Marne, built in 1760, consisting of three skew arches, the middle arch of which has a span of 81 feet, and the side arches, spans of about 77 feet; the Neuilly Bridge across the Seine, built between the years 1768 and 1774, and which consists of five elliptical arches, each 128 feet in span; and the Gignac Bridge over the Herault, built in 1793, and which consists of an elliptical centre arch 161 feet in span, flanked by two semi-circular arches, each of which have a span of 72 feet.

Although the masonry and stone arch bridges of the 19th century cannot be considered as showing much, if any, structural improvement over those of preceding times, it is a fact that the engineers of the 19th century used their better knowledge of the theory of those structures, obtained from the progress of the science of statics, to increase the spans of the arches far beyond the limits set by the earlier practice.

Of these later productions, the largest stone arch in the world at the time was that of the Luxemburg Bridge, completed in 1901; it is 277 feet in span, with a rise of 102 feet and a clear height of about 138 feet above the level of the water. It is surpassed in span by the Plauen Bridge which crosses the valley of the Syra, a flat elliptical arch 295 feet in span with 58 feet rise, and a width of 56 feet. Other modern stone arches of magnitude are the Grosvenor Bridge over the river Dee at Chester, the largest span in England, consisting of a single arch with a span of 200 feet, and the Waterloo Bridge across the Thames, of nine elliptical arches of Aberdeen granite, of 120 feet span each, with a rise of 34 feet. The total length of the structure, including the approaches, is 2,456 feet, and it carries a horizontal roadway 41½ feet wide between the parapets.

In America the earliest notable stone bridge structure was the Tempoalo aqueduct near Huauchinango, Mexico, built between 1553 and 1570. It consists of 68 semi-circular arches, the largest span being 58 feet. Its maximum height was 124 feet. Another Mexican stone aqueduct bridge of note was a part of the water supply system of the city of Queretaro, built by the Spaniards between 1726 and 1735. It has 74 spans of 50 feet each, and a maximum height of 92 feet.

The earliest stone bridge in the United States of which there is definite record was that at Ipswich, Mass. It has two spans of 28 feet each. The Rochester aqueduct begun in 1820, and the Washington aqueduct (over the Potomac) begun in 1837 were the first important stone bridges in the country. High Bridge, carrying the Croton aqueduct across the Harlem River, surpassed all previous constructions. This bridge has 15 arches, the eight crossing the water being 80 feet wide, and the seven land spans being 50 feet wide. The height in the clear is 100 feet above high water, and the parapet is 116 feet above the same level. Its total length is 1,460 feet. It was built between 1837 and 1842. Cabin John Bridge, carrying the Washington (city) aqueduct, was built between 1857 and 1864. It is a single arch of 220 feet span — and a 110-degree segment of a circle whose radius is 134 feet. The rise of the arch is 57 feet. For many years it was the longest stone arch in the world.

Beginning with 1835, many of the early wooden railroad bridges in the United States have been replaced by stone bridges. The first was the Carrollton Viaduct, carrying the Western Maryland Railroad across the Patapsco Creek. In 1847 the Starucca Viaduct was built to carry the Erie Railroad over the Starucca Creek. This was of sandstone, in 17 flat arches of 51 feet span, 1,200 feet long, and the floor 110 feet above the creek. At first it accommodated only a single track, but it was afterward doubled on the original plan, for a second track. In 1881 a stone-arch viaduct of five 70-foot spans was built for the Philadelphia and Reading Railroad over Wissahickon Creek, and a similar bridge for the Lake Shore and Michigan Southern Railroad over the Grand River at Painesville, Ohio. In 1881 a stone-arch bridge notable for its length was begun over the Mississippi River at Minneapolis. It was of 22 spans, four of which were 100 feet, fifteen of 80 feet, and one each of 71 feet, 43 feet and 40 feet. It carried union tracks at a height of 65 feet above the water. In 1888 the Pennsylvania Railroad Company began to replace its wooden and iron bridges with more permanent structures of stone and concrete, and some of these are of notable dimensions. The largest is the bridge over the Susquehanna at Rockville, Pa., begun in 1901. It has 48 spans of 70 feet each, and is in all 3,820 feet in length. The facings are of masonry, and the body is filled in with concrete. Many other stone bridges were built on other railroads in the period 1900 to 1910. Since then the use of concrete as railroad bridge material has come into great favor. The more recent stone bridges in the United States have been ornamental structures for architectural effects in parks and cities. They are mostly arches of comparatively small dimensions.

About the beginning of the 19th century, metal began to be extensively introduced as a material of construction, and although the masonry arch was superior in beauty and durability, the metal bridge gave greater strength in proportion to the weight of the structure; was capable of being built more quickly and cheaply, and therefore, being better adapted to keep pace with the tremendous activity of modern railway construction, it soon almost completely supplanted the stone structures.

The first structure in which the new material was used exclusively appears to be the bridge across the Severn near the town of Ironbridge, Shropshire, England. It was built by Abraham Darby, the owner of the ironworks of Coalbrookdale, in 1779, and consists of a single arch 100 feet in span, with a rise of 45 feet. The arch is composed of five cast-iron ribs in the form of a segment of a circle. The successful construction of such a structure being thus clearly demonstrated, several others, of bolder design, were built during the last quarter of the 18th century, of which the Wearmouth Bridge, over the Wear at Sunderland, completed in 1796, is the most elegant example of the type. As originally constructed, it consisted of a single hingeless arch 236 feet in span, with a rise of 34 feet above the springing lines, which were 65 feet above the level of the river.

From these beginnings the evolution of various types of metal arch structures was rapid. A large percentage of wrought iron was employed in the material of construction, affording greater flexibility in the methods of construction and design, and the capability of spanning greater intervals with single spans. The most notable of the structures built about this time (the early part of the 19th century) was the Southwark Bridge across the Thames, completed in 1819. It consists of three arches, of which the central arch is 240 feet in span, the largest cast-iron span ever built, and the side arches 210 feet each. They are composed of massive cast-iron arch ribs, which being set without any provisions to counteract the effects of expansion, and being much heavier than is necessary to sustain the loads to which they are subjected, gives a structure which is merely the imitation of one of stone, with the additional fault of a great wastefulness of material. Its construction, however, served a valuable purpose in the development of metal arch engineering. It suggested the principle of hinged arches, which was subsequently taken under consideration by the mathematicians of Europe in 1841, and developed into a perfect theory, which made the metal arch a statically determinate structure on absolutely immovable foundations, and one that was provided against distortion and rupture under conditions of varying temperature.

Although the fine cast-iron bridges such as the Westminster and the Blackfriars, built across the Thames during the period covered by 1860 to 1870, consisted of arches with spans as great as 185 feet, the metal hinged-arch bridges built since 1873 have surpassed them greatly, not only in the length of the spans, but in the economy of the material of construction.

An exception to this statement, however, must be noted in the case of the cast-steel Eads Bridge across the Mississippi, at Saint Louis, Mo., which was completed in 1874. It consists of three unhinged structures, the centre arch being 520 feet in span. Of the hinged-arch bridges the following are the most notable: The Alexander III Bridge across the Seine at Paris, built in 1899, consisting of a single arch with a span of 353 feet, composed of arch-ribs made up of wedge-shaped cast-steel sections bolted together; the steel-arch railway bridge across the Niagara River, finished in 1896, consisting of a single arch with a span of 550 feet; and the highway and foot-bridge completed in 1899 across the Niagara Gorge, just below the Falls, consisting of a single steel arch with a span of 840 feet, which made it the largest single span steel-arch bridge in the world until surpassed by the Hell Gate Bridge.

Some of the other handsome and important structures of the metal hinged-arch type well worthy of mention are the following: The Washington Bridge over the Harlem River, at New York, completed in 1889, which consists of two magnificent arches, each 510 feet in span, flanked by four masonry arches at one end, and three at the other, each 50 feet in span; the Detroit-Superior Bridge, a three-hinge steel-arch truss of 591 feet span, with a double deck for pedestrians, vehicles and electric cars; the Old Trails Arch Bridge over the Colorado River, below Needles, Cal., a three-arch span of 592 feet; the German steel-arch bridges across the Rhine at Bonn and Düsseldorf, the former with a central arch of 614 feet span, and two side deck arches each 307 feet in span, and the latter with two central arches each 595 feet in span; the Pia Maria Bridge over the Douro at Oporto, Portugal, consisting of a main steel arch of crescent design, 525 feet in span with a rise of 123 feet; and the steel arch on Garabit Viaduct over the Truzère, in central France, which has a span of 540 feet with a rise of 170 feet, and the deck 406 feet above the water.

As the tensile strength of wrought iron and steel was greatly increased by improved processes of manufacture, great feats of bridge-construction were dared by the bridge engineers, and various types of suspension and cantilever bridges, especially suitable for very long spans, were designed and successfully erected. The first wire suspension bridge in any country was the Schuylkill River Bridge at Philadelphia, built in 1816. It had a span of 408 feet and was but 18 inches wide. It was supported by cables of six ⅜-inch wires. But even the more important wire cable and chain structures of the early 19th century, such as the bridge across the Menai Strait, between the Island of Anglesey and Carnarvonshire, in Wales, completed in 1826, with a span of 580 feet, and Fribourg Bridge, in Switzerland, built in 1834, with a span of 870 feet, were completely overshadowed by the works of the American engineers during the period dating from 1848 onward. Of these magnificent structures, the most notable are the following: The bridge at Wheeling, W. Va., erected by Charles Ellet, in 1848, with a suspension span of 1,010 feet; the Niagara Bridge, built by John A. Roebling, in 1855, with a clear span of 825 feet, and particularly distinguished as the first railway suspension in the world; the Cincinnati and Covington Bridge, built by the same engineer, in 1867, with a clear span of 1,057 feet, and a total length of 1,692 feet; and the last creation of the same engineer, the first New York and Brooklyn Suspension Bridge, across the East River, which was completed in 1883. This bridge connects Park Row, Manhattan, with Sands and Washington streets, Brooklyn. It was begun in 1870, and completed in 1883, at a cost of $9,000,000. It has been altered, repaired and extended so that its total cost in 1920 was about $25,094,577, including the cost of land for approaches. The original structure consisted of a main suspension span of 1,595½ feet, and two shore spans of 930 feet each. With the approaches it had a total length of 5,989 feet, but these approaches have been extended so that the total length of the bridge with extensions is now 7,580 feet. The four steel wire cables are each 15¾ inches in diameter, and support the roadway and the stiffening trusses at a height of 135 feet above high-water level, at the centre of the span. The combined supporting strength of the cables is 48,000 tons. The cables are carried over saddles at the tops of two stone towers, each 278 feet above high water, and anchored at each end in solid cubical structures of stone masonry 119x132 feet, which rise to 90 feet above high water. The width of the bridge is 85 feet, and there are four tracks, two of which carry the cars of the elevated road, and two for surface trolley cars. There are also two driveways and a footway. The traffic on this bridge, as shown by official counts made in October 1920, averages 3,844 elevated railway cars, 5,856 surface cars, 5,188 vehicles and 1,928 pedestrians daily.

The Williamsburg Bridge is noteworthy as being the first great suspension bridge to employ steel instead of masonry towers, and as having the longest suspended span built up to 1912. It connects Delancey street, New York, with South Fifth and Sixth streets, Brooklyn, and was completed in 1904, requiring eight years for construction. It has a clear span of 1,600 feet and a total length of 7,308 feet. Four steel wire cables, each 18⅗ inches in diameter, swung from two steel towers, each 333 feet above high water, support the roadway platform and the stiffening trusses at a clear headway of 140 feet above high water level, at the centre of the span. The width of this bridge is 118 feet and the roadways are on three levels, so that it has greater carrying capacity than the Brooklyn Bridge, though the traffic is less. On the lower level are four tracks; on the second, two vehicle ways and two footways; on the third, tracks for elevated cars. The tower foundations were sunk 66 feet on the New York side and 107 feet on the Brooklyn side, at the lowest points, so that the extreme height of structural work is 440 feet. There are 17,403 miles of wire in the cables, and the four cables with suspenders weigh 4,900 tons. The weight of steel and iron in the main bridge is 23,800 tons, and in the approaches 16,600. Its carrying capacity is 38,770 tons. The anchorages measure 149 x 128½ feet at the top and contain 112,800 cubic yards of masonry. The cost, exclusive of land, was $14,000,000.

The Queensborough or Blackwell's Island Bridge crosses the East River from New York to Brooklyn at the southern end of Blackwell's Island, on which rest two of its piers. The main bridge is a continuous cantilever and the spans are 1,052, 630 and 1,182 feet respectively from west to east. The total length from Second avenue to Crescent street is 7,449 feet. Construction was begun in 1901 and completed in 1909, the cost (excluding land) being $13,496,500. The width is 90 feet, the roadways being 53 feet, with 16-foot sidewalks. There is 135 feet clear space under the main span for a width of 400 feet, this being practically identical with the vessel-space under the other New York and Brooklyn bridges. The total of steel and iron employed is 73,800 tons. The carrying capacity is 89,800 tons. The towers bear observation balconies on Blackwell's Island which reach a height of 333 feet above high water and are reached by stairways and elevators.

The Manhattan Bridge connects the Bowery and Canal streets, New York, with Nassau street, Brooklyn. Work was begun in 1901 and completed in 1911. The structural expense was $14,104,900, and it has the greatest transporting capacity of any bridge up to its date. It is of the suspension type, having a river span of 1,470 feet, with the shore spans of 725 feet. The total length with approaches is 6,855 feet. It is 122½ feet in width and is double-decked, and this tremendous roadway requires for its support four of the largest cables constructed to date, each 21¼ inches in diameter. The total ultimate strength of these cables is 120,000 tons, or two-and-a-half times that of the Brooklyn Bridge cables. The cables run over the steel towers at a height of 322 feet above high water, and with their suspenders they weigh 7,950 tons.

There are 37 strands in each cable and 256 wires in each strand, making a total of 9,472 wires in each of the four cables. As each wire is more than half a mile in length (3,223½ feet), the total length of wire is 23,858 miles, sufficient to girdle the earth at the equator. The weight of steel in each anchorage is 1,300 tons, and of each side span 5,000 tons. The main span weighs 8,000 tons, the Manhattan approach 8,500 tons and the Brooklyn approach 8,000 tons. The excavation for each pier was about 40,000 cubic yards, and the masonry and concrete in each of the anchor piers totaled approximately 115,000 cubic yards, by far the heaviest ever laid. The towers weigh 6,300 tons each, and the three spans weigh 19,000 tons. On the lower deck are two subway tracks, driveways and footwalks. Above are four railway tracks to accommodate surface and elevated cars. The carrying capacity is 57,820 tons. The above-described four great bridges over one river, within a distance of five miles, erected at a total cost (without land and approaches) of $90,229,429, constitute the most marvelous achievement the world has recorded in bridge-building.

Another remarkable bridge crosses the East River at Hell Gate, a few miles north of the group just described. This bridge, carrying the New York Connecting Railroad and comprising the largest steel arch in the world (1916), has a span of 977½ feet, made up of 23 panels 42½ feet between centres. The depth of truss at the ends is 140 feet, at the centre 40 feet and at the quarters 66 feet. The upper member of the arch truss shows a reverse curve when nearing the abutments, to afford head room for trains: it also adds much to the beauty of the structure. The rise of the arch is 220 feet. The lower chord is rectangular, 7 feet in width, 10½ feet deep at the abutments and 7½ feet at the crown. The weight of the bridge averages 26 tons to the lineal foot. The direct thrust of the arch is upon solid walls of concrete. The clearance at the centre when the closing chord was put in place was 3½ inches. This was closed by lowering the jacks on the main posts from 15 to 20 inches. This final work was conducted through a multi-party telephone system, with stations at the centre, at each backstay jack, at each counterweight and at the office — all stations being directly connected with all the others. The foremen at the telephones "listened in" and each heard all the orders given and all comments made as the work progressed. The bridge contains 18,000 tons of steel. Its designer was Gustav Lindenthal.

The Spokane-Portland Railway finished in 1909 a drawbridge over the Willamette River below Spokane, which has a draw span of 521 feet, being one of the longest ever built. The total length of the bridge is 1,762 feet, and the piers are of reinforced concrete.

The most noteworthy bridge of the far North is that over Copper River, Alaska, completed in 1910 for the Alaskan Railway. No such difficult bridge engineering has been undertaken before in such a cold climate. Owing to the nearness of large active glaciers, which at times filled the river with great masses of broken ice, the bulk of the construction work had to be completed within a few months' time. Four steel camel-back spans totaling 1,550 feet constitute the bridge proper, the two longest of these spans being 450 feet each. Three concrete piers were sunk in the river, and the entire work completed at the remarkably low cost of less than half a million dollars.

The Erie Railway completed in 1910 a steel viaduct in Jersey City, N. J., having a length of 1,776 feet, and leading up to a cut in Bergen Hill. This involved bridgework of structural steel, resting on concrete. Owing to the soft nature of the ground, which was largely wet sand, it was necessary to sink many concrete caissons, and where the sand was more solid to use concrete piles.

Recent Foreign Construction.— The Quebec Bridge a cantilever truss, having the longest span (1,800 feet) of any bridge to date (1916), surpasses the Forth Bridge (Scotland) by 90 feet, and the Williamsburg Bridge by 200 feet. It was designed to carry two railroad tracks loaded with the heaviest modern traffic and two footways. The live load was figured at 5,000 pounds per lineal foot, with two E-60 locomotives. The wind pressure is figured at 30 pounds per square foot of both trusses and 300 pounds per square foot of trains. The main posts of the cantilevers over the piers are of four separate columns latticed together, 9 feet by 10 feet each, standing on a shoe 19 feet high and 22 feet by 26 feet at its base and weighing 400 tons. The maximum cross section of the posts is 1,903 square inches, and they weigh 1,500 tons each. The members next to the posts are 7 feet 2 inches deep by 10 feet 4 inches wide, and have a cross section of 1,902 square inches. They are composed of four webs 7 feet deep, each web being of four plates riveted together, having a total thickness of 3¾ inches. The suspended span, 640 feet long and 88 feet wide, was assembled on a pile trestle nearby and six scows floated under it at the panel points and sunk on prepared foundations. Cross girders and bracing were built up on the scows, at low water the scows were drained, and at high water the span floated free of the trestle. It was lifted to its place from the river by eight 1,000-ton hydraulic jacks, two at each of the corners of the cantilever arms. There has not been any such remarkable bridge building in the Old World. Two new bridges were completed over the Rhine at Cologne in 1908, one having 492 feet of span and the other 550 feet. The Risorgimento Bridge, across the Tiber at Rome, was completed in 1911. It has a span of 328 feet, and is chiefly noteworthy because of its historic site, and from the fact that the false work on which the arch rested during construction was built of steel and concrete, instead of wood.

The Swiss Sitter River Viaduct, which was completed in 1911, is only 400 feet long, but is notable because it crosses a gorge at a height of 1,130 feet. At Auckland, New Zealand, was completed in 1910, the largest concrete arch in that part of the world, having a span of 320 feet, the minor spans giving the bridge a total length of 960 feet. In Africa the Sudan Railway has built a bridge over the Blue Nile at Khartum, which was completed in 1909, and which rests on 20 steel cylinders, each 16 feet in diameter, and carried down as far as 60 feet below low water. The seven largest spans of this interesting bridge are each 218½ feet. In Tonkin, Indo-China, French interests have built a bridge over the Red River, a cantilever, of 19 spans, having a total length of 5,544 feet. The longest span is 429 feet. The Yunnan System Railway will use the bridge.

The suspension principle has been far more extensively employed in America, and especially in the United States, than in foreign countries. Some of the European suspension bridges, however, are of great beauty of design, such as the structure across the Danube at Buda-Pesth in Austria-Hungary, which is considered to be the handsomest bridge in the world, but they are entirely outclassed in magnitude by the almost marvelous creations of American engineering genius already described.

Bridges built on the cantilever or balanced-span principle rank with those of the suspension and girder-and-arch type for the purpose of spanning great intervals.

In order to trace the evolution of the cantilever-bridge from the girder, and to understand its relation to the truss, a brief mention of the tubular bridges which were originated by Robert Stevenson, engineer of the Chester and Holyhead Railway, England, to carry that railway across the Menai Strait is necessary.

A series of experiments conducted by Stevenson, in conjunction with Fairbairn, demonstrated that a rectangular tube with a cellular top and bottom gave a girder in which the greatest strength was derived from the least amount of material. The result was the construction of the Conway and Britannia bridges, the former across the Conway River and the latter across the Menai Strait, in 1846 and 1847, respectively. The Conway tube consisted of a single span of 400 feet, and the Britannia of four spans, two of 460 feet each, and two of 230 feet each in the clear. The example set by Stevenson was followed in a few other cases, the most important of which was the Victoria Bridge across the Saint Lawrence, near Montreal, Canada, built in 1854. It consisted of 24 spans ranging in length from 242 to 247 feet each, and one span of 330 feet. It had a total length of 9,144 feet, or nearly one and three-quarter miles, and required about 9,000 tons of iron for the construction of the tubes. It was replaced in 1898–99 by a pin-connected truss bridge of 24 spans of 254 feet each, and one span of 348 feet, which represented a total weight of 20,000 tons of steel, but which was capable of sustaining a load five times greater. The Victoria Bridge was the last important structure of this type, which disappeared from engineering practice when the special conditions which developed it ceased to exist; but it led the way to the plate girder bridges. It taught the engineer to cut away all the useless material in the plans of his structures and retain only the effective working skeleton, and thus inaugurated a truly scientific method of metal construction, by which the weight of the structure was greatly reduced, and consequently its cost of construction.

In the meantime, the principle of the truss, first enunciated by Palladio, the famous Italian architect, about 1560, and subsequently developed still further, and without doubt independently, by such geniuses as Ulric Grubermann, Timothy Palmer, Lewis Wernway, Theodore Burr, William Howe, Wendall Bollman, and others of equal merit, during the period extending from 1754 to 1854, was diverted from its application to wooden bridges, and used in the construction of metal structures. The combining of the truss and the girder was the next logical step in the evolutionary process, and to Roebling belongs the credit of demonstrating the practicability of building long span braced girder or truss bridges with iron and steel as the material of construction. As the cantilever bridges are a class of structures actually composed of hinged continuous braced girders, their intimate relation to the girder and truss bridges is quite obvious. They were, however, not much used until the last quarter of the 19th century. The construction of the Kentucky Viaduct in 1876, and the Niagara cantilever in 1883 demonstrated the ease with which they could be built without the use of costly false work, and soon afterward many bridges were built both in Europe and America. The most important of these are: the bridge across the Hudson at Poughkeepsie, N. Y., built in 1889, which consists of five river spans ranging from 525 to 548 feet in length, and a total length of 6,767 feet; the Red Rock Cantilever Bridge across the Red River in California, built in 1890 with a centre suspended span of 30 feet, the shore and river cantilever arms being each 165 feet, and a total length of 990 feet; the

Memphis Bridge across the Mississippi River at Memphis, Tenn., built in 1892, with a truss span of 621 feet, and two cantilever spans of 700 feet each, which are the longest of the kind in the United States; the Saint John River cantilever in New Brunswick, built in 1895, with a main span of 477 feet, and a total length of 813 feet; the great Forth Bridge across the Firth of Forth, in Scotland, which was completed in 1890, and consists of two shore spans of 680 feet each, and two main spans of 1,710 feet each, which are exceeded only by the Quebec cantilever across the Saint Lawrence, the new construction of which began in 1911, and has a clear span of 1,800 feet.

All bridge structures, regardless of the materials of construction, may be classified as to type: arch, suspension, cantilever, truss or girder, or a combination of these types. In designing them the problem of first importance is to make them strong enough to withstand the forces brought to bear upon them. These include the stresses of «dead load,» the weight of the bridge itself; the live, or moving load, of the traffic over the bridge; impact and vibration from the moving load; wind pressure; the momentum of a stopping train; and, if the bridge be built on a curve, centrifugal force. The wind pressure is not one of the least of a bridge's burdens. It is figured at 30 pounds per square foot of one girder in girder bridges, or on one truss of through bridges, or on two trusses in deck bridges, and the floor in truss bridges; and in addition, 300 pounds per lineal foot of any train which may pass over the bridge.

For spans of less than 25 feet, rolled beams are commonly used; from 25 feet up to 100 feet, plate girders; from 100 feet up to 150 feet, riveted trusses; above 150 feet, pin-connected trusses. The depth of a plate girder is usually from one-twelfth to one-eighth of the span; of a truss, one-sixth of the span.

Outside of the economic purposes of the bridge itself, modern taste demands attention to the environment, and it is expected that the engineer will contrive a structure which shall be pleasing to the eye as well as useful.

Bridges are also classified as to their economic uses, as: Railway Bridges and Highway Bridges; and as to their structural peculiarities, as Movable Bridges, Pontoon Bridges, Military Bridges, etc.

Modern railway bridges are almost exclusively constructed of steel and consist of trusses or plate girders designed to sustain uniform loads ranging from 3,000 to 4,800 pounds per linear foot of track, according to the length of span and the service required. There are about 80,000 of such bridges in the United States aggregating 1,400 miles in length and representing a cost of $800,000,000. All steel bridges, however, must be regarded as temporary, with a life limited to the crystallization of their metal. Many of them are being replaced by reinforced concrete.

Highway bridges include all bridges used for roadway purposes alone. They may be constructed of wood, metal, masonry or concrete and are usually designed to sustain uniform loads ranging from 1,000 to 1,800 pounds per linear foot of track, according to the length of span and the service required.

Movable bridges or drawbridges include the various types of structures over rivers, that can be moved in order to allow a clear passageway for vessels.

The modern structures of this type may be divided into the following classes: (1) Swing Bridges; (2) Rolling Bridges; and (3) Lift Bridges; of which the first are the most commonly used.

A swing bridge consists of a wooden or metal truss supported at the centre by a pier located in the middle of the stream, so that when the bridge is closed the ends of the truss rest upon abutments on the shores on either side. It is operated by a turntable, upon which it rests, which is revolved by a rack and pinion arrangement worked by hand power, steam or electricity.

A rolling bridge consists of a single truss mounted on rollers, and which is pushed out from one side across the span, or of two trusses, on each side of the span which are pushed out and connected at the centre of the span where the water ends are locked together when the bridge is closed. It is operated by the rope and drum method. This type is not used to any great extent.

Lift bridges are of various kinds — the «vertical lift,» the «hinged lift» or «bascule,» and the «rolling lift» bridges. The simplest is the vertical lift bridge consisting of a truss which is raised vertically to the desired height, both ends rising in guides arranged on towers. A typical example is the highway bridge over the Louisville and Portland Canal at Louisville, Ky. The lift span is a Pratt truss 210 feet long. It lifts 40 feet, giving 55 feet clearance. It is operated by crane-like trusses counterweighted with concrete masses, pivoted on the main posts of the approach spans. The lift span is raised by electric power in one minute. Another notable lift bridge with several unique features is that at Pine Bluff, Ark., across the Arkansas River. The river at this point is normally 2,000 feet wide and the channel is liable to shift to almost any section of that width. Six of the channel spans are 239 feet long and one of them is arranged to lift by towers attached to the ends of the two adjoining spans. In case of a shift of the channel, the towers can be moved and any other of the six spans converted to lift. The counterweights are of cast iron of the expanding type to balance the heavy sprocket chains used to operate the lift. The motive power is electricity. The hinged lift bridge is raised by being revolved in a vertical plane around hinges at one end. The rolling lift bridge is also lifted in a vertical plane, but has in addition a limited rolling motion. All lift bridges usually have a counterweight to assist the lifting effort, and are generally designed to move quickly — one minute being frequently specified as the time limit for opening or closing at points where land and water traffic is heavy.

The longest swing bridges ever constructed are the Interstate Bridge at Omaha, Neb., which has a total length of 520 feet; the Thames River Drawbridge at New London, Conn., which has a length of 503 feet; and the Arthur Kill Drawbridge between Staten Island, N. Y., and New Jersey, which has a swing span of 496 feet.

The most notable of the hinged or pivot-bascule bridges in Europe is the Tower Bridge across the Thames, near the Tower of London, England, which consists of a suspension and drawbridge combined with a central bascule span of 200 feet, formed by two leaves or trusses, hinged at the opposite towers. The United States has many examples of the bascule type of bridge, one of the principal ones being a great single-leaf bridge at Chicago, carrying three tracks of the Chicago and Northwestern Railway across the Chicago River. This bridge is 185 feet long, covering with one leaf nearly as great a span as the London Bridge does with two leaves. The largest bascule bridge in the world is that carrying the Canadian Pacific Railway from Sault Sainte Marie, Ontario, to Sault Sainte Marie, Mich., over the United States Ship Canal. This bridge is of the heel trunnion type, 330 feet long, in two leaves. When closed it forms virtually a simple fixed span, with a compression joint at the top of the truss and a tension joint at the bottom. The counterweights are of concrete, each of 550 cubic yards and weighing 1,000 tons. One of the largest bascule bridges is that at Salmon Bay, Seattle, carrying the Great Northern Railway. It is of the Strauss low trunnion type and is a single span of 200 feet. Its total movable weight is 2,350 tons, which is counterweighted by a mass of concrete measuring 21 feet by 34 feet by 28 feet — 735 cubic yards in all. The wind pressure of this bridge when open is calculated at 6,955,500 foot-pounds.

The modern pontoon bridges are a development of the ancient bridge-of-boats principle. A notable example of the type is the pontoon bridge built in 1873 across the Hooghly River, at Calcutta, India. It is 1,530 feet in length between the abutments on each bank of the river and consists of a superstructure carried on 14 pairs of rectangular iron pontoons with rounded bilges and wedge-shaped ends. These pontoons are 10 feet wide, 8 to 11 feet deep and 160 feet long and are built in 11 watertight compartments. They are held in position across the river by means of 1¾-inch chain cables laid across and anchors laid up and down the stream. The superstructure consists of trestle-work, which carries a plank roadway and footpath platform having a total width of 62 feet at a height of 27 feet above the surface of the river. This height is sufficient to allow ordinary boat navigation, but the passage of large vessels is provided for by arrangements which permit the opening of a span 200 feet wide by the temporary removal of four of the pontoons and the superstructure carried on them. A pontoon bridge over the Golden Horn at Constantinople is 1,531 feet long and 82 feet in width. An opening span gives 205 feet clearway: it is pivoted at one side and swings through an arc of 180 degrees. The longest pontoon bridge in existence is the railroad bridge over the Mississippi River at Prairie du Chien, Wis. It is 7,000 feet long and crosses an island. There are two pontoon sections, one 2,000 feet long to the east of the island and another 1,500 feet long west of it. This bridge was rebuilt in 1898. The pontoon bridges of the United States army are of two kinds: one built of wood throughout and the other a wood frame with canvas covering. The pontoons are 31 feet long, 5 feet 8 inches wide and 3 feet deep. The wooden type weigh 1,600 pounds apiece, the canvas ones 510 pounds.

Military bridges are temporary structures erected to facilitate the movements of troops, their supplies and their armament, during the course of extensive field operations. The proper equipment of a modern army includes the material required for the construction of pontoon bridges of a limited length. This material consists of the necessary cables and pontoons of canvas, the metal or wooden frames of which are capable of being «knocked down» and packed for transportation. Spar bridges are usually made with round timbers cut near the location of the bridge. The most efficient and useful are those built in the form of trestles consisting of timber frames on which the stringers carrying the roadway are placed. The most notable examples of military bridge construction in the United States are the pontoon bridge built across the Potomac at Harper's Ferry, under the direction of General Banks, in February 1862, which was composed of 60 boats, and the trestle 80 feet high and 400 feet long, built at another period of the Civil War across the Potomac Creek, Virginia, for railroad purposes.

Concrete Bridges.— While definite knowledge derived from experience in the endurance of concrete under the demands of bridge service was lacking, engineers were slow to adopt it in place of the well established stone and iron construction. But more and more of late years confidence has grown in the reliability of concrete as bridge material, and now concrete bridges of every type are to be found in all parts of the world. Such failures as have been recorded have been due to faulty handling of the material. The actual proof of the dependability of concrete was contributed by an experiment upon a German bridge (at Düsseldorf) about to be replaced by a larger one. This bridge was but a few years old and had a span of 92 feet. It was loaded with 18 times the load for which it had been designed, and then showed only a few small cracks. The experiment ended at that point and the bridge was demolished with dynamite. The concrete in this bridge had been mixed in the proportion of 1 part cement, 4 parts sand and 4 parts sharp chipped stone.

The considerable expense formerly incurred in building timber centres for concrete arches has been largely done away with by the use of light steel truss supports hinged at the centre of the arch. These need to be strong enough only to support the material used in constructing the arch rib, as this in turn will support all the structure above it. Other advantages of concrete construction for bridges are that the work is more speedily accomplished and that the plant required is simpler and that the ultimate cost is less — with small bridges very much less.

The simplest form of concrete bridge, in use only for short spans, is the girder type. This is sometimes constructed upon a skeleton I-beam, but more commonly the reinforcement is of substantial rods mainly along the tension side of the beam, arranged in the conventional lines of stress. Such a bridge may be supported on piers or on trestle bents, also of concrete. A notable example of the concrete girder structure is the double-deck viaduct, 1,700 feet long, at Kansas City, crossing the tracks of 32 railroads which use the Union Station in the Kaw Valley. A peculiar feature of this viaduct is that the upper deck is on a grade of 5.527 per cent and the lower deck is of three different grades beginning at 2.34 per cent and rising to 3.47 per cent. The 12th Street Viaduct in Saint Louis is another example. It is 1,481 feet long and 79 feet wide, built in 36 slab and girder spans. It is in two separate sections longitudinally, one inch apart, each section being carried on a double row of piers.

A reinforced concrete through truss bridge has recently been erected near Merthyr, Wales. It is of two spans of 94 feet each. The trusses are of the Warren type, 10 feet deep and in 11-foot panels. The pier and abutments are of skeleton structure, remarkably light in weight. The lower chord has a cross section 10 by 18 inches and the upper chord is 18 by 18 inches. The web members are 10 by 10 inches. The reinforcement of the lower chord is of 12 1¼-inch rods in two sets of six, overlapping beyond the panels to which they are apportioned and terminating in hooks.

A notable example of the concrete cantilever truss type is the bridge carrying the Victoria (Australia) sewer across the Barwon River and its flats. It is 2,424 feet long, in 13 spans of 176 feet and one of 136 feet. The suspended spans are 40-foot girders, free to move at one end.

The prevailing type of concrete structure, however, is the arch. While in many instances the forms of the arch usually seen in masonry have been closely followed, a peculiar flat form has been developed as the typical concrete arch. A striking example of this type is the Risorgimento arch over the Tiber at Rome. It is the longest concrete arch yet (1916) constructed — a span of 328 feet 1 inch. The rise is 32 feet. The structure is cellular, of seven arched ribs 6 feet 6 inches wide at the key, expanding to 10 feet at the piers. The ribs are 4 feet deep at the key and 10 feet at the piers. Another remarkable bridge of the same slender type is the Pont Mativa over the river Ourthe, at Liège, Belgium. It is a span of 180 feet with a rise of but 12 feet and only 14 inches deep at the centre. This flat arch type is used principally for low bridges. For high-level bridges a high arch is generally chosen, sometimes reaching the deck with its centre, but often carrying the deck on a series of spandrel arches footed on the main arch. The open spandrel arch saves much in material and weight, besides lending itself to most pleasing architectural designs. The latest development of this type of bridge is a main arch composed of separate ribs, above which rise the spandrel arches on pillars, instead of the solid through and through walls of earlier constructions. Among notable long-span arches must be mentioned the 315-foot span of the Langwies Viaduct on the Chur-Arosa electric railway (Switzerland), rising 134 feet above the spring of the arch and 203 feet above the valley; the Auckland (New Zealand) arch, a clear span of 320 feet with a rise of 84 feet; the Larimer avenue (Pittsburgh) arch, a clear span of 300 feet 5 inches, the longest in the United States; the Stein-Teufen arch (Switzerland), a span of 259 feet; and the Walnut Lane (Philadelphia) arch, a clear span of 232 feet. The bridge at Luxembourg has a concrete span of 250 feet, but is sprung from masonry abutments.

Of multiple-arch structures in concrete the Tunkhannock Railway Viaduct holds first place. It is 2,375 feet long and carries the Lackawanna Railroad across the valley of Tunkhannock Creek. The arches are semi-circular, 10 of them being of 180 feet span and two of 100 feet. They are supported on piers 36.5 feet by 43.5 feet. Each of the main arches is composed of two ribs on which rest the spandrel columns which carry the deck at a level of 242 feet above the bed of the creek. The concrete in this viaduct measures 167,000 cubic yards, making it the largest concrete bridge structure in the world (1916). The second largest as to cubical content of concrete is the viaduct at Cleveland, Ohio, spanning the Cuyahoga River. This has 12 quadruple arches, averaging 140 feet in span, and contains 106,900 cubic yards of concrete. The river channel is spanned by a double-deck steel arch truss 591 feet long, with a clear headway of 96 feet above the river. The Martin's Creek Viaduct, carrying three tracks of the Lackawanna Railroad, is 1,611 feet long, supported by seven three-centred arches of 150 feet span with spandrel arches above. The deck is 48 feet wide and is at a level 150 feet above the creek. The Saskatoon Viaduct crosses the Saskatchewan River with 10 arches, four of which are of 150-foot span. The bridge is constructed of two 16-foot arch rings, 15 feet apart, and the floor of girders and beams is carried on spandrel walls and columns. A very high arch viaduct carries a highway over the Cuyahoga River gorge near Akron, Ohio, at an elevation of 190 feet. There are five main arches, each of 127 feet. The three high piers are hollow.

The bow-string type of bridge has been very successfully constructed of concrete, replacing worn-out timber and iron bridges on highways.

Other concrete constructions have been used in special cases. The concrete bridge over the Miles River at Easton, Md., 1,075 feet long, was cast in sections at Baltimore, 60 miles distant. Piles were driven in sets of three across the river, and upon each set was cast a cap of concrete. On these were laid the floor slabs, four abreast, and they were united into a monolith by pouring cement. These slabs were 20 feet long, 5 feet wide and 18 inches thick. The side railings and ornamental facings were cast in special molds. Eleven bridges carrying trains in Kansas City were recently erected of concrete blocks, some of them weighing 48 tons, and molded seven miles from where they were placed. One of the latest forms of concrete construction is the arch built up of separate precasted voussoirs which are placed on a centre from suspension cables swung from construction towers on the river banks.

A great advance has been made within a few years in the ornamental phase of concrete as used in bridges. Besides an improvement in the general design, success has been attained in the surface appearances, both as to texture and color. Surfaces are tooled or bush-hammered, and in some instances the green concrete has been scrubbed with wire brushes to expose the aggregate, and by a judicious selection of the aggregate for such finishing, highly satisfactory results are secured. Variation in color is obtained by using colored sand, broken tile and bricks and black oxide in the concrete mixture. Cast ornamental slabs have been used with effect on park bridges, where also, the railings offer especial opportunities for artistic finishing. Some excellent examples of this work are the Q Street Bridge over Rock Creek at Washington, the Sixty-sixth Avenue Arch in Philadelphia and the Long Island Railroad Viaduct at Forest Hills, L. I. In the Anderson Memorial Bridge at Harvard, over the Charles River, a most pleasing result has been attained by the use of brick trimmings with the concrete. For additional information on concrete bridge construction see CONCRETE BRIDGES.

For further information see articles entitled BRIDGE CONSTRUCTION, AMERICAN; BRIDGE CONSTRUCTION, MODERN METHODS OF; BRIDGES, LIFT; FOUNDATION, etc.

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BRIDGE-BUILDING BROTHERHOOD, a fraternal religious order formed in the 12th century in southern France. Its object was the building of bridges and the keeping of ferries. Tradition connects its origin with Saint Bénezét, through whose efforts a bridge across the Rhone at Avignon was begun in 1117. After the completion of this bridge in 1185 the order received the sanction of Clement III. The order was dissolved by Pius II.

BRIDGE CONSTRUCTION, American. The application of scientific principles to the construction of bridges is more complete to-day than ever before. This statement applies to the specified requirements which the finished structure must fulfil, the design of every detail to carry the stresses due to the various loads imposed, the manufacture of the material composing the bridge, the construction of every member in it, and finally the erection of the bridge in the place where it is to do its duty as an instrument of transportation.

A close study of the economic problems of transportation in the United States and the experimental application of its results led the railroad managers to the definite conviction that, in order to increase the net earnings while the freight rates were slowly but steadily moving downward, it was necessary to change the method of loading by using larger cars drawn by heavier locomotives, so as to reduce the cost of transportation per train mile. While these studies had been in progress for a number of years and there was a gradual increase in the weight of locomotives, it is only within the years 1885–90 that the test was made, under favorable conditions and on an adequate scale, to demonstrate the value of a decided advance in the capacity of freight cars and in the weight of locomotives for the transportation of through freight. The test was made on the Pittsburgh, B. & Lake Erie Railroad, which was built and equipped for the transportation of iron ore from Lake Erie to Pittsburgh and of coal in the opposite direction.

When the economic proposition was fairly established, it was wonderful to see how railroad managers and capitalists met the situation, by investing additional capital for the newer type of equipment and for the changes in road bed and location necessarily involved by that in the rolling stock. Curves were taken out or diminished, grades were reduced, heavier rails were laid and new bridges built, so that practically some lines were almost rebuilt. The process is still going on and money by the hundred millions is involved in the transformation and equipment of the railroads. Some impression of the magnitude of the change in equipment may be gained from the single fact, that one of the leading railroads has within a few years expended more than $20,000,000 for new freight cars alone, all of which have a capacity of 100,000 pounds.

The form of loading for bridges almost universally specified by the railroads of this country consists of two consolidation locomotives followed by a uniform train load. These loads are frequently chosen somewhat larger than those that are likely to be actually used for some years in advance, but sometimes the heaviest type of locomotives in use is adopted as the standard loading. The extent to which the specified loadings have changed in late years may be seen from the following statement based on statistics compiled by Ward Baldwin and published in the *Railroad Gazette*:

Of the railroads whose lengths exceed 100 miles, located in the United States, Canada and Mexico, only 2 out of 77 specified uniform train loads exceeding 4,000 pounds per linear foot of tracks in 1893, while in 1901, only 13 out of 103 railroads specified similar loads less than 4,000 pounds. In 1893, 37 railroads specified loads of 3,000 pounds and 29 of 4,000 pounds, while in 1901, 4,000 pounds was specified by 50, 4,500 pounds by 14 and 5,000 pounds by 17 railroads. The maximum uniform load rose from 4,200 in 1893 to 7,000 pounds in 1902.

In a similar manner in 1893 only one railroad in 75 specified a load on each driving wheel axle exceeding 40,000 pounds, while in 1901 only 13 railroads out of 92 specified less than this load. In 1893 only 21 of the 77 railroads specified similar loads exceeding 30,000 pounds. The maximum load on each driving wheel axle rose from 44,000 pounds in 1893 to 60,000 pounds in 1901.

In 1916 on the majority of railroads the prevailing practice is to design the bridges for axle loads of 60,000 pounds and practically no bridges are being built for lighter axle loads than 50,000 pounds. Bridges designed in accordance with present standards of details will safely carry an overload of 50 per cent in regular service without restriction in speed, and a still larger load with restricted speed.

The unusual amount of new bridge construction required since 1890 caused a general revision of the standard specifications for bridges, the effect of which was to include the results of recent studies and experiment, and to eliminate some of the minor and unessential items formerly prescribed.

Meanwhile another movement was in progress. Experience having shown the great advantage of more uniformity in various details and standards relating to the manufacture of bridges both in reducing the cost and the time required for the shop work, an effort was begun to secure more uniformity in the requirements for the production and tests of steel, which is the metal now exclusively employed in bridges.

With greater uniformity in the physical, chemical and other requirements for steel, as determined by standard tests, the unit stresses to be prescribed for the design of bridges will naturally approach to a corresponding uniformity. To what extent this is desirable may be inferred from the fact that the application of several of the leading specifications to the design of a railroad bridge under a given live load yields results which may vary by an amount ranging from zero to 25 per cent of the total weight.

In the revision of specifications a decided tendency was observed to simplify the design by making an allowance for impact, vibration, etc., by adding certain percentages to the live load according to some well-defined system. It needs but relatively little experience in making comparative designs of bridges under the same loading, to show the advantage of this method over that in which the allowance is made in the unit stress according to any of the systems formerly adopted in such a case. Not only are the necessary computations greatly simplified, but the same degree of security is obtained in every detail of the connections as in the principal members which compose the structure.

In 1907–08 a series of experiments were made under the auspices of the American Railway Engineering Association to determine the proper percentage of the live load to be added for the effect of impact. Experimental trains were operated over bridges at different speeds and the actual stresses in different members of the bridge trusses were measured by special instruments designed for the purpose. The results were published in 1911 in the ‘Proceedings of the Association.’

In 1914 a series of large-size tests of steel columns was begun by the United States Bureau of Standards in co-operation with several of the national engineering societies to determine accurately the variations in the strength of built-up columns due to the form of cross-section, the manner in which the structural shapes are connected, the ratio of slenderness, the quality of material, etc. A number of tests have also been made by the bureau for consulting engineers and bridge companies in which different alloy steels were used. The latter test columns were one-half of the actual sizes as designed for several long-span bridges.

The American Railway Engineering Association in 1903 made the first successful attempt to standardize American railroad bridge specifications. These specifications, revised at intervals, are now recognized as standard and are generally used not only as the basis for the design of new metal bridges, but also as a basis for determining the strength of bridges constructed under other specifications.

A movement which has done much good since 1890 and promises more for the future is that of the organization of bridge departments by the railroad companies. The great economy of making one design rather than to ask a number of bridge companies to make an equal number of designs, of which all but one are wasted, is the first advantage; but another of even greater significance in the development of bridge construction is that which arises from the designs being made by those who observe the bridges in the conditions of service and who will naturally devote closer study to every detail than is possible under the former usual conditions. The larger number of responsible designers also leads to the introduction of more new details to be submitted to the test of service, which will indicate those worthy of adoption in later designs. In order to save time and labor and secure greater unformity in the design of the smaller bridges, some of the railroads prepare standard plans for spans varying by small distances. For the most important structures consulting bridge engineers are more frequently employed than formerly, when so much dependence was placed upon comparative designs made by the bridge companies.

An investigation was made in 1901 by a committee of the Railway Engineering Association in regard to the present practice respecting the degree of completeness of the plans and specifications furnished by the railroads. It was found that of the 72 railroads replying definitely to the inquiry, 33 per cent prepare «plans of more or less detail, but sufficiently full and precise to allow the bidder to figure the weight correctly and if awarded the contract to at once list the mill orders for material»; 18 per cent prepare «general outline drawings showing the composition of members, but no details of joints and connections»; while 49 per cent prepare «full specifications with survey plan only, leaving the bidder to submit a design with his bid.» If, however, the comparison be made on the basis of mileage represented by these 72 railroads, the corresponding percentages are 48, 24 and 28 respectively. The total mileage represented was 117,245 miles. A large majority of the engineers and bridge companies that responded were in favor of making detail plans.

The shop drawings, which show the form of the bridge, the character and relations of all its parts, give the section and length of every member and the size and position of every detail, whether it be a reinforcing plate, a pin, a bolt, a rivet or a lacing bar. All dimensions on the drawings are checked independently so as to avoid any chance for errors. The systematic manner in which the drawings are made and checked, and the thorough organization of every department of the shops, make it possible to manufacture the largest bridge, to ship the pieces to a distant site, and find on erecting the structure in place that all the parts fit together, although they had not been assembled at the works.

The constant improvement in the equipment of the bridge shops and the increasing experience of the manufacturers who devote their entire time and attention to the study of better methods of transforming plates, bars, shapes, rivets and pins into bridges, constitute important factors in the development of bridge construction.

In 1911–15 a new tendency in bridge construction was shown in the introduction of various alloy steels of considerably higher strength than the grade of structural steel which has been the recognized standard during the previous decade. Nickel steel was used for some members of the Municipal Bridge at Saint Louis and the new Quebec cantilever bridge, Mayarí steel in the second Memphis cantilever bridge, high carbon steel in the Hell Gate Arch and the continuous truss bridge at Sciotoville, and silicon steel in the Metropolis Bridge.

As the length of span for the different classes of bridges gives a general indication of the progress in the science and art of bridge building, the following references are made to the longest existing span for each class:

In plate girder bridges the girders, as their name implies, have solid webs composed of steel plates. The longest plate-girder span is 130 feet 6½ inches between centres of bearings, was erected in 1916 at 79th street, Chicago, where the Nickel Plate Railroad crosses the tracks of the Illinois Central Railroad. The bridge is a part of the scheme to eliminate grade crossings at Grand Crossing. Previous to that the longest span was 128 feet 4 inches, located on the Mahoning division of the Erie Railroad and erected in 1902. The longest ones in a highway bridge are those of the viaduct on the Riverside Drive in New York, erected in 1900, the span being 126 feet. The heaviest plate girder is in the skew span of the Boston & Albany Railroad where it crosses the New York, New Haven & Hartford Railroad at Worcester, Mass. A single girder weighs 170 tons, is 122½ feet long and 10½ feet deep. In 1901 the heaviest girder weighed 103 tons.

The large amount of new construction and the corresponding increase in the weight of rolling stock have combined to secure a more extensive adoption of plate girders and the designs of many new details for them. These affect chiefly the composition of the flanges, the web splices, the expansion bearings and the solid floor system. Solid bridge floors, in which the ordinary ballasted track is carried by transverse metal troughs, were introduced in 1887, while those in which reinforced concrete was first used were built in 1903. Recent development in solid floors relates mainly to those types in which steel beams supply the necessary strength and concrete protects the beams and supports the ballast. Solid floors may not only be made much shallower than the ordinary open type, thereby reducing the total cost of the track elevation, but they also permit the ordinary track construction with cross-ties in ballast to be extended across the bridge, thus avoiding the jar which otherwise results as the train enters and leaves the bridge, unless the track is maintained with extraordinary care.

The necessity for bridges of greater stiffness under the increased live loads has also led to the use of riveted bridges for considerably longer spans than were in use formerly. The use of pin-connected trusses for spans less than about 150 feet is undesirable for railroad bridges, on account of the excessive vibration due to the large ratio of the moving load to the dead load or weight of the bridge itself.

While riveted bridges are now quite generally used for spans from 100 to 150 feet, they have been employed to some extent up to 425 feet. The recent forms of riveted trusses do not, however, conform to the general character of European designs, but embody the distinctively American feature of concentrating the material into fewer members of substantial construction. With but rare exceptions the trusses are of the Warren, Pratt and Baltimore types with single systems of webbing. At a distance where the riveted connections cannot be distinguished, the larger trusses have the same general appearance as the corresponding pin bridges.

When a bridge extends over a valley it often consists of a series of plate-girder spans supported by towers, while the stream may be crossed by one or two plate-girder or simple truss spans. Such a structure is known as a viaduct.

The recent examples of viaduct construction with their stiff bracing of built-up members and riveted connections exhibit a marked contrast to the older and lighter structures with their adjustable bracing composed of slender rods. The longest as well as the highest viaduct in America is located on the Crow's Nest line of the Canadian Pacific Railway at Lethbridge, Alberta. Its length is 5,327.6 feet and its height 314 feet from the base of the track-rail to the bed of the river. The tower spans are 67 feet and the intermediate spans 100 feet in length. It was completed in 1909 and accommodates a single track. The longest double-track railroad viaduct is 2,558 feet long and carries the Chicago and Northwestern Railway across the valley of the Des Moines River. It was built in 1901. Along with this viaduct should be mentioned the viaduct terminal of the Chesapeake and Ohio Railroad at Richmond, Va., whose length, including the depot branch, is 3.13 miles. A large part of this is not very much higher than an elevated railroad in cities. The excellent details and clean lines of this substantial structure give it a character which is surpassed neither in this country nor abroad.

While the elevated railroads which have been built recently also embody many of the characteristics of the best viaduct construction, special study has been given to improve their æsthetic effect. The use of curved brackets, of connecting plates whose edges are trimmed into curves so as to reduce the number of sharp angles, and of rounded corners of posts, constitute some of the means employed. The results are seen in the structures of the Boston Elevated Railroad and in some of the latest construction in Chicago.

The longest simple truss-bridge span (not continuous over supports) having trusses with riveted connections throughout is in the terminal railroad bridge at Kansas City over the Missouri River. The length of span is 425 feet 6½ inches between centres of bearings. This is a structure with a highway on the upper deck and a double-track railroad on the lower deck. The bridge was completed in 1911.

The longest simple truss-bridge span with pin-connected trusses is 720 feet long. It is in a bridge to accommodate the Burlington, Illinois Central, Louisville and Nashville and Frisco railroads in crossing the Ohio River at Metropolis, Ill., and was completed in 1917. It would have been slightly more economical to use a cantilever bridge for three of the spans, but the deflections for the simple trusses are smaller and determined the choice. Next in size are the spans of the Saint Louis Municipal Bridge over the Mississippi River. The three river spans are each 668 feet long and were erected in 1912. The bridge is designed to carry a double-track railroad on the lower deck and a highway on the upper one. This is one of the earliest bridges in which nickel steel was employed, the loading being very heavy. In the same year (1912) another bridge was completed at Louisville, Ky., replacing a cantilever bridge over the Ohio River to New Albany, Ind., the longest span in which is 615 feet 2¼ inches. It accommodates a double-track railroad between the trusses and highways outside of the trusses, supported by cantilever brackets.

The recent changes in the details of pin-connected truss bridges have been mainly the result of efforts to eliminate ambiguity in the stresses of the trusses, to reduce the effect of secondary stresses and to secure increased stiffness as well as strength in the structure. Double systems of webbing have been practically abandoned so far as new construction is concerned. The simplicity of truss action thus secured permits the stresses to be computed with greater accuracy and thereby tends to economy. Before 1900 very few through bridges, and those only of large span, were designed with end floor beams in order to make the superstructure as complete as possible in itself and independent of the masonry supports. Now this improved feature is being extended to bridges of small spans. Similarly dropping the ends of all floor beams in through bridges so as to clear the lower chord and to enable the lower lateral system to be connected without producing an excessive bending movement in the posts has likewise been extended to the smaller spans of pin bridges and is now the standard practice. The expansion bearings have been made more effective by the use of large rollers and of bedplates so designed as to properly distribute the large loads upon the masonry. In the large spans of through bridges the top chord is curved more uniformly, thereby improving the æsthetic appearance.

The stiffness of truss bridges has been secured by adopting stiff bracing in the lateral systems and sway bracing instead of the light adjustable rods formerly used. At the same time, adjustable counter-ties in the trusses are replaced by stiff ones, while in some cases the counters are omitted and the main diagonals designed to take both tension and compression.

Some of the same influences referred to above have led to much simpler designs for the portal bracings by using a few members of adequate strength and stiffness, conforming in general character to those of the trusses.

The corresponding development of short-span highway bridges was long delayed. The conditions under which highway bridges were purchased by township and county commissioners were decidedly unfavorable to material improvements in the character of their design and construction. It is a comparatively rare occurrence that the commissioners employ a bridge engineer to look after the interests of the taxpayers by providing suitable specifications, making the design, inspecting the material and examining the construction of the bridge to see that it conforms to all the imposed requirements. These provisions are only made in some of the cities, and accordingly one must examine the new bridges in cities to learn what progress is making in highway bridge building.

The most important advance in the construction of highway bridges outside of cities is due to the organization of State highway departments in many of the States, which include the organization of bridge departments for the preparation of suitable specifications, standard plans for different types of bridges, as well as special plans, and which furnish competent inspection during construction. The most noteworthy change is due to the extensive adoption of slab and beam bridges of reinforced concrete and of reinforced-concrete arches instead of the flimsy steel truss bridges formerly used. Where steel trusses are employed they are carefully designed for long service and ultimate economy. This movement is promoted largely on account of the extensive use of automobiles and of auto-trucks.

The longest span of any cantilever bridge in the world is that of the bridge over the Saint Lawrence River near Quebec. Its length between centres of towers is 1,800 feet. The cantilever arms project 580 feet from each tower and support between them the suspended span 640 feet long. The anchor spans outside of the towers are 515 feet long. The main posts in the towers are 310 feet high. The trusses have a unique "K system" of bracing, which was adopted because it greatly facilitates the method of erection and at the same time gives greater regularity in the deflection of the truss joints under moving loads. In the cantilever span nickel steel is employed except in the floor system and a part of the cantilever arms. Friction brakes with a capacity of 250,000 pounds are provided to take up the expansion at both ends of the suspended span. The bridge accommodates a double-track railroad and also highway traffic. It was completed in 1917. The span of this bridge is larger than that of any other class of bridges. The next in size of cantilever spans in America is that of the Queensboro Bridge over the East River at New York, completed in 1909. Its span length is 1,182 feet.

Many bridges with trusses continuous over one or more piers have been built in Europe but exceedingly few in America. Until it was replaced by simple trusses in 1913, the Canadian Pacific Railway Bridge over the Saint Lawrence River at Lachine, near Montreal, had the longest spans, 408 feet. It then seemed as if no other bridge of that type would be built in this country, but this expectation was not realized. In 1917 a double-track bridge was built across the Ohio River near Sciotoville by the Chesapeake and Ohio Northern Railway having two spans, each 775 feet long. All the connections of the trusses are riveted. As the rock foundations are practically on the same level across the river, the conditions were favorable for a continuous bridge. For other long bridges, see BRIDGE.

One of the most interesting developments relating to the subject under consideration is the construction of a considerable number of metallic arch bridges in recent years and the promise of their still greater use in the future. On account of their form they constitute one of the handsomest classes of bridges.

The first important steel bridge in the world was completed in 1874. It is the arch bridge which in three spans crosses the Mississippi River at Saint Louis. Its arches are without hinges and their ends are firmly fixed to the piers. This is one of the most famous bridges in existence. It is the longest span in America for any arch bridge without hinges.

The longest span of any metallic arch bridge with two hinges is that of the Hell Gate Bridge. Its length is 977½ feet between the centres of end hinges. It is on the line of the New York Connecting Railroad, which connects the Pennsylvania with the New York, New Haven and Hartford at New York. It is a four-track bridge with ordinary ballasted tracks laid on a solid floor of metal and concrete. It contains a number of unusual features in its design and is notable for its beauty of form as well as its magnitude. The curved bottom chord has a rise of 220 feet. It is 7 feet wide and varies in depth from 7½ to 10½ feet, and thus compares closely in size with the bottom chord of the Quebec Bridge. It was completed in 1917. Next in length of span is the upper arch over the Niagara River, built in 1898. Its span is 840 feet.

The largest arch with three hinges is in the highway bridge over the Colorado River at Needles, Cal., the span being 592 feet and the rise 100 feet. The roadway is suspended from the arch near the centre and supported by posts near the ends. It was opened to traffic in 1916. The steel arch span in the Detroit-Superior Viaduct in Cleveland, built in 1916, has a span only one foot shorter. See BRIDGE.

Since 1900 an unusual development has taken place in the construction of reinforced-concrete arches. Not only has a very large number of such bridges been built in this country, but the greatest span now exceeds that of any stone arch bridge in the world. The largest clear span in America is 300 feet 4⅞ inches, that of the Larimer Avenue Bridge in Pittsburgh, Pa., completed in 1912. The floor system of slabs and beams is supported by columns resting upon the two arch ribs, which are braced together by horizontal struts, all constructed of reinforced concrete. The largest span in which plain concrete is used in the arch rings is 281 feet and is in the highway bridge at Monroe street, Spokane, Wash., completed in 1911.

The largest concrete arch viaduct in the world is located on the Delaware, Lackawanna and Western Railroad at Nicholson, Pa., and is known as the Tunkhannock Viaduct on account of the name of the creek which it crosses. It contains 10 spans of 180 feet and 2 spans of 100 feet, the total length being 2,230 feet. It is a double-track structure and was completed in 1915. It is not the longest but the largest in total mass. It contains approximately 4,509,000 cubic feet of concrete and 2,280,000 pounds of reinforcing steel. Its height is 242 feet above the bed of the stream.

It is the smaller steel structures which are destined more and more to be replaced by arches of this material. The steel bridges require repainting at frequent intervals, constant inspection, occasional repairs and finally replacing by a new structure after a relatively short life, on account of rust and wear, unless it is required even sooner on account of a considerable increase in the live load. The concrete arch requires practically no attention except at very long intervals.

The safety of operating the traffic makes it desirable to have as few breaks as possible in the regular track construction of a railroad, and this constitutes an additional reason why concrete or stone arches are being substituted for the smaller openings. The decreasing cost of concrete tends to an extension of this practice to openings of increasing size. In 1901, however, a bridge was completed which marks a decided departure from previous practice. The Pennsylvania Railroad built a stone bridge, consisting of 48 segmental arches of 70 feet span, at the crossing of the Susquehanna River at Rockville, Pa. It is 52 feet wide, accommodates four tracks and cost $1,000,000. This bridge has not only the advantage of almost entirely eliminating the cost of maintenance, but it also has sufficient mass to withstand the floods which occasionally wreck the other bridges on that river. In 1903 the same railroad built a similar bridge over the Raritan River at New Brunswick, N. J.

The longest span of a stone arch bridge in America is that which carries the Washington aqueduct and a highway over Cabin John Creek, near Washington, D. C. The span is 220 feet long in the clear.

Of movable bridges the largest swing span existing was erected in 1908 over the Willamette River at Saint Johns, near Portland, Ore. Its length is 521 feet between centres of end supports, and is located on the Northern Pacific Railway. The Illinois Central Railroad Bridge over the Missouri River at East Omaha, Neb., has a span one foot shorter and was completed in 1893. Both of them are double-track bridges.

In a direct-lift bridge a simple truss span is lifted vertically to permit boats to pass. The largest span is 220 feet and is in the Oregon-Washington Railroad and Navigation Company's bridge over the Willamette River at Portland, Ore., completed in 1912. This is a double-deck structure with the highway on the upper and the railroad tracks on the lower deck. In the lift span the lower deck is suspended from the trusses and may be lifted 46 feet independently of the truss span to give a clear height above low water of 72 feet. When more clearance is required, the truss span is also lifted. The upper deck has a lift of 93 feet, thus giving a total clearance of 165 feet above low water or 144 feet above high water. In the Kansas City bridge referred to as having the longest simple trusses with joints riveted throughout, there is one span, 428 feet long, which has only the suspended railroad deck movable. In 1916, 33 direct-lift bridges had been built in the United States and Canada.

In cities where dock room is very valuable, there are serious objections to the swing bridge, which requires so much room in which to turn. In narrow streams like the Chicago River and its branches the centre or pivot pier also interferes seriously with the waterway and forms an obstruction to navigation. The bascule bridge was introduced to obviate these difficulties. It acts somewhat like a trap-door hinged at one end. One type of bascule, known as a rolling lift bridge, was first built over the Chicago River at Van Buren street in 1895. Another type is known as a trunnion lift bridge. The longer spans have two leaves, while the shorter ones have only one leaf. The largest double-leaf bascule bridge has a span of 336 feet, built in 1913, over the Sault Sainte Marie Ship canal on the Canadian Pacific Railway. In closing, the leaves of this span come together at the centre and interlock so as to form a simple-truss bridge when closed. The lower chords are joined like railroad cars but with a double coupler that can transmit a high tensile stress.

The longest span with a single leaf is 235 feet, built in 1913. It is at the crossing of the Calumet River, South Chicago, by the Baltimore and Ohio Railroad and is a double-track bridge. The Canadian Pacific Railway Bridge over the Kaministiquia River has two decks, accommodating a double-track railroad on the lower deck and a highway on the upper deck. Its span is 186 feet long and was built in 1913. The Lake Shore and Michigan Southern Railway Bridge over the Portage River at Port Clinton, Ohio, is a four-track bridge, two tracks being supported between and two outside of the trusses. Its span is 118 feet and was completed in 1914.

Several other improved forms of hinged-lift bridges have also been designed and built in Chicago and elsewhere. In a small bridge erected in 1896 on the Erie Railroad in the Hackensack Meadows there is only a single leaf hinged at one end and lifted by a cable attached to the other end. The counterweight rolls on a curved track so designed as to make the counterbalance equally effective in all stages of opening and closing the bridge.

A novel bridge was built in 1902 over the ship canal at Duluth, which is different from any other type in this country. The general scheme is similar to that of a design made by a French engineer who built three of the structures in different countries. It consists of a simple truss bridge 393 feet 9 inches long, supported on towers at a clear height of 135 feet above high water. Instead of supporting the usual floor of a highway bridge, it supports the track of a suspended car which is properly stiffened against wind pressure and lateral vibration, the floor of the car being on a level with the docks. This ferry is operated by electricity. The loaded car, its hangers, trucks and machinery weigh 120 tons. In the French design a suspension bridge was used instead of the simple truss bridge.

The longest span of any suspension bridge, not only in America but in the world, is 1,600 feet. It is that of the Williamsburg Bridge over the East River at New York city and was completed in 1904. The span of the famous Brooklyn Bridge, completed in 1883, is 1,595½ feet. The very handsome Manhattan Bridge, located between these two, has a span of 1,470 feet and was completed in 1909. A critical observation of these three bridges illustrates what can be done to improve the æsthetic features of monumental bridges.

A bridge across the Charles River between Boston and Cambridge deserves especial mention and marks a decided advance in the growing recognition on the part of municipal authorities of the importance of æsthetic considerations in the design of public works. It consists of 11 spans of steel arches whose lengths range from 101½ to 188½ feet. Its width is 105 feet between railings. It is claimed that this bridge "will be not only one of the finest structures of its kind in this country, but will be a rival of any in the Old World." Its length between abutments is 1,767½ feet, and it was estimated to cost about $2,500,000.

The problems incident to the replacing and strengthening of old bridges frequently tax the resources of the engineer and demonstrate his ability to overcome difficulties. Only a few examples may be cited to indicate the character of this work. In 1900 the Niagara cantilever bridge had its capacity increased about 75 per cent by the insertion of a middle truss without interfering with traffic. In 1897 the entire floor of the Cincinnati and Covington suspension bridge was raised four feet while the traffic was using it. It may be of interest to state that the two new cables, 10½ inches in diameter, which were added to increase the capacity of the bridge, have just about three times the strength of the two old ones, 12⅓ inches in diameter, and which were made a little over 30 years before. In the same year the old tubular bridge across the Saint Lawrence River was replaced by simple truss spans without the use of false-works under the bridge and without interfering with traffic. On 25 May 1902, the Pennsylvania Railroad Bridge over the Raritan River and canal at New Brunswick, N. J., was moved sidewise a distance of 14½ feet. Five simple spans 150 feet long and a drawbridge of the same length, weighing in all 2,057 tons, were moved to the new position and aligned in two minutes and 50 seconds. The actual times that the two tracks were out of service were respectively 15 and 28 minutes. On 17 Oct. 1897, on the same railroad near Girard Avenue, Philadelphia, an old span was moved away and a new one, 235 feet 7 inches long, put in exactly the same place in two minutes and 28 seconds. No train was delayed in either case.

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BRIDGE CONSTRUCTION, Modern Methods of. A bridge is a structure designed to carry traffic over (a) a natural depression in the earth's surface, (b) a water way, (c) a highway or railroad track. The traffic or moving load is known as the "live load," and the weight of the bridge itself as the "dead load."

Bridge structures may be divided into four general classes, viz.: (a) girder bridges, (b) truss bridges, (c) suspension bridges and (d) arch bridges.

Girder and truss bridges have vertical reactions, i.e., exert only vertical pressures upon their supports or abutments. More than 90 per cent of modern bridge structures are girder or truss bridges. The longer spans are built of steel, while timber or reinforced concrete is sometimes used for the shorter spans.

A truss is composed of members or parts joined together at their intersections to form a rigid framework. The most rigid form of framework is the triangle, as it is the only figure the shape of which cannot be altered without changing the length of its sides. It is therefore the «truss element» and all trusses, no matter how complicated in construction, consist of a series of triangles and may be treated as such. The members of a truss are designed to resist the forces or loads which it supports and which tend to lengthen or shorten the several members. A truss member resisting a tendency to lengthen sustains a stress known as tension, while one resisting a tendency to shorten sustains a stress known as compression. The joints must be designed to resist shear, i.e., the tendency of the member to pull away from or slide through the joint.

A truss bridge consists of two or more trusses which support the roadway or floor system. Truss bridges are of three kinds in theory and design. (1) A simple truss rests upon two supports and is not connected rigidly to any adjacent span. (2) A continuous truss rests on more than two supports, i.e., is continuous over one or more supports. (3) A simple cantilever truss is fixed at one end and without support or free at the other.

Simple Trusses.— Probably over 90 per cent of all bridge trusses are simple trusses. They have the advantage of not being dependent upon absolutely unyielding supports and the stress distribution throughout the various members can be more definitely ascertained than in other types. Fig. 1 is a skeleton diagram of a simple bridge truss. The upper chord is a compression member, and the lower chord a tension member. The truss members between the two chords are known as «web» members, being designated as struts or ties accordingly as they are in compression or tension. In Fig. 1 the diagonal members are all in tension except the end posts. In some trusses the counterties are omitted and the diagonal members designed to resist both tension and compression.

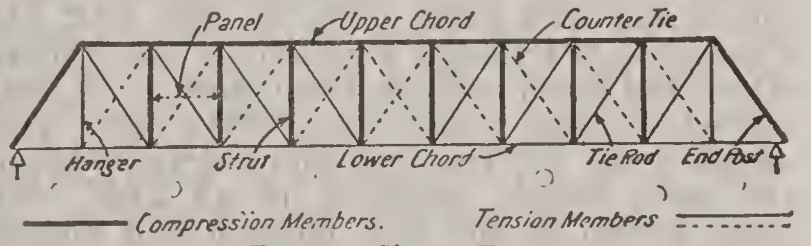

Fig. 1.— Simple Truss.

Types of Simple Trusses.—The Pratt truss, Fig. 2, is the type most commonly used in America for spans under 250 feet. Its advantages are simplicity, economy of metal and suitability for connecting to the floor and lateral systems. The counter-ties indicated by the dotted lines may be omitted as noted above. When the upper chord is inclined, this type of truss is known as a Parker truss, Fig. 3, and is then adaptable for somewhat longer spans.

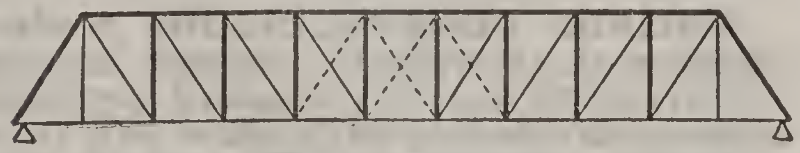

Fig. 2.—Pratt Truss.

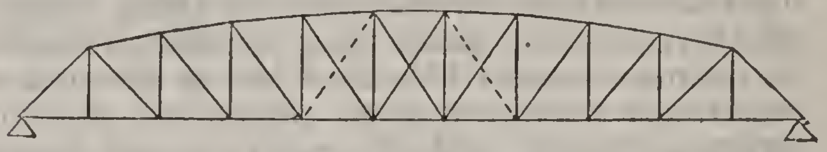

Fig. 3.—Parker Truss.

The Baltimore truss, Fig. 4, is a modification of the Pratt truss and can economically be used for longer spans than the latter. Long panels make an uneconomical floor system, and in the Baltimore truss, by the addition of a short diagonal and suspender, the short panel length for the floor system is obtained, while the main diagonals and posts are not increased in number beyond the economic limit, as in this truss they extend over two panels of the floor system. Similarly, the Pennsylvania truss, Fig. 5, is a modification of the Parker truss and is economical for still longer spans. The Baltimore truss and the Pennsylvania truss are frequently referred to as Pettit trusses.

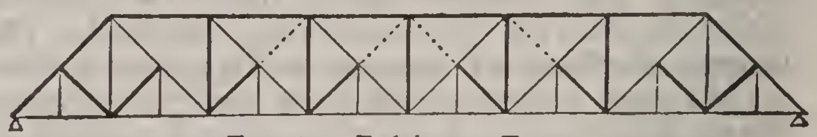

Fig. 4.— Baltimore Truss.

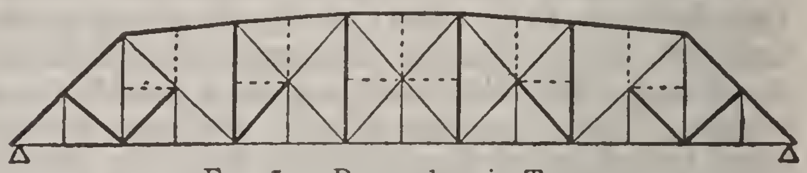

Fig. 5.— Pennsylvania Truss.

The Warren truss, Fig. 6, is principally used for short spans in elevated railroad construction, being preferable to a plate girder since it furnishes less obstruction to the light. This type of truss with verticals added, Fig. 7, is extensively used for short spans, for all classes of traffic.

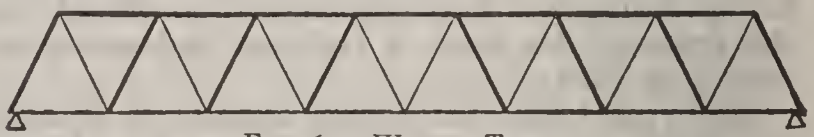

Fig. 6.— Warren Truss.

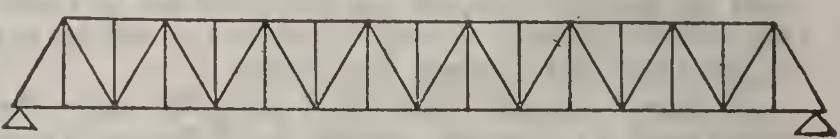

Fig. 7.— Warren with Verticals.

The Double Intersection Warren truss, Fig. 8, is still occasionally used, but the uncertainty of the actual distribution of the stresses has led to its gradual disuse. This truss, with subverticals added as indicated by the broken lines, is economical of metal, but the objection noted above, together with its less sightly appearance in comparison with other types, has prevented its being adopted except in rare instances.

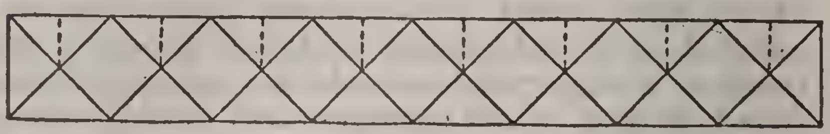

Fig. 8.— Double Intersection Warren.

The Howe truss, Fig. 9, is confined to structures built partly of timber, and is therefore limited to short spans or to comparatively light traffic. Unlike the Pratt truss, the counters (in this case counter struts) cannot be omitted, as the diagonals are designed to bear against the joints and cannot take tension.

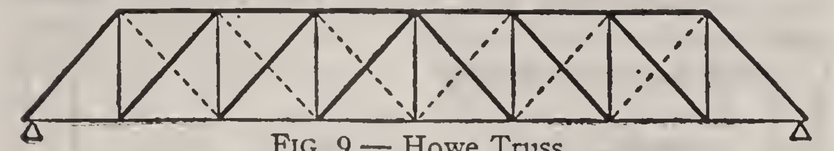

Fig. 9.— Howe Truss.

The Lenticular truss, Fig. 10, is rarely seen in America. In fact, with one striking exception, no truss of this type has been built here for many years, but there are some of early construction still in use. Although somewhat pleasing to the eye, it is very wasteful of metal, as the long web members have very little stress, but must of necessity contain a certain amount of metal.

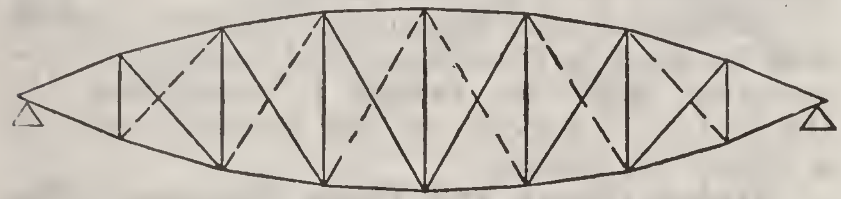

Fig. 10.— Lenticular Truss.

The K truss, Fig. 11, is a new type introduced into America in 1915, which seems likely to come into favor in the future. It has the advantage over the Pettit trusses of having more uniformity of deflection.

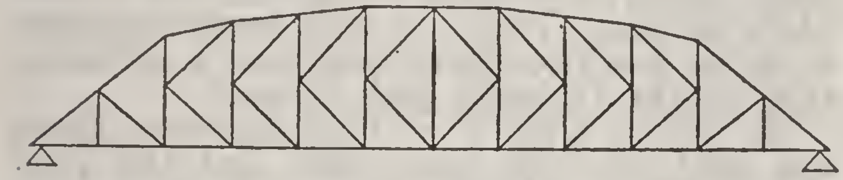

Fig. 11.— K-Truss.

Continuous Trusses.—Continuous trusses are seldom built except for swing bridges, Fig. 12. While economical of metal as compared with the same number of simple truss spans, a slight yielding of the supports would develop additional and unprovided-for stresses in many of the truss members. The use of continuous trusses is therefore confined to sites where there is an absolute certainty that the supports will be unyielding. Fig. 13 shows the longest and one of the very few continuous bridges of any considerable span that have ever been built. There may be a greater development of this type in the future.

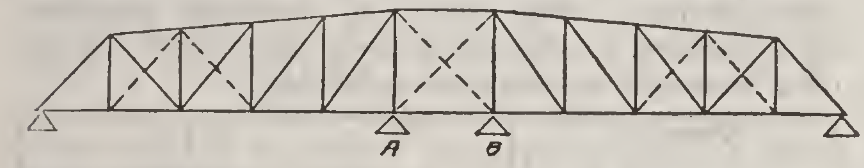

Fig. 12.— Swing Bridge Truss.

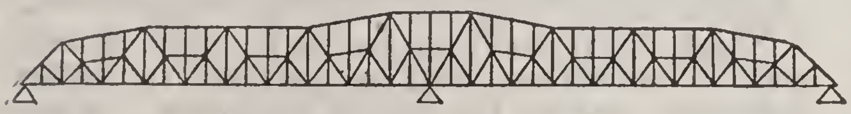

Fig. 13.— Continuous Bridge Truss.

Movable Bridges.— One type of movable bridge has already been mentioned, i.e., the swing bridge. A circular track provides the two centre supports, A and B, Fig. 12, and the bridge may be rotated on this track, becoming a balanced cantilever when opened, while when closed it is generally continuous for the live load.

Another type in which the movable span is raised at one or both ends is the bascule bridge. One form of bascule bridge is illustrated in Fig. 14. By means of the operating pinion which is geared to the strut, and to which in turn is geared the operating mechanism, the bridge may be raised or lowered, the balance being maintained by the concrete counterweight. When closed this bridge acts as a simple span under live load, and in this particular the single leaf type of bascule is preferable to the double leaf, operated from both ends; for without expensive interlocking devices the latter cannot be made to act as a simple span, but becomes either an arch or cantilever structure under live load. The truss of a bridge of this kind may have various arrangements of the web members. The direct lift bridge (Fig. 15) is more economical than a bascule except for comparatively short spans, while its operating mechanism is more simple. When the movable span is only part of the whole bridge structure, the towers may be constructed upon and as part of the trusses of the adjacent spans.

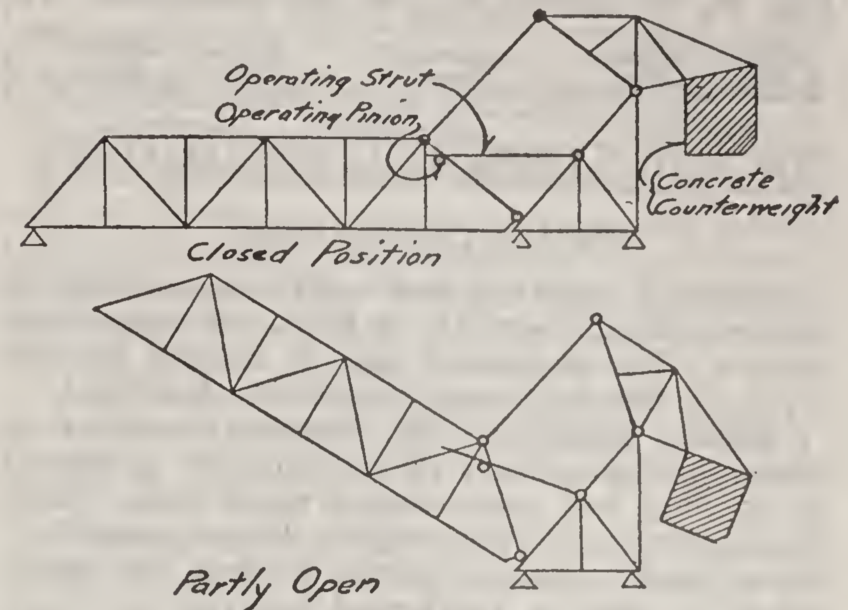

Fig. 14.— Bascule Bridge.

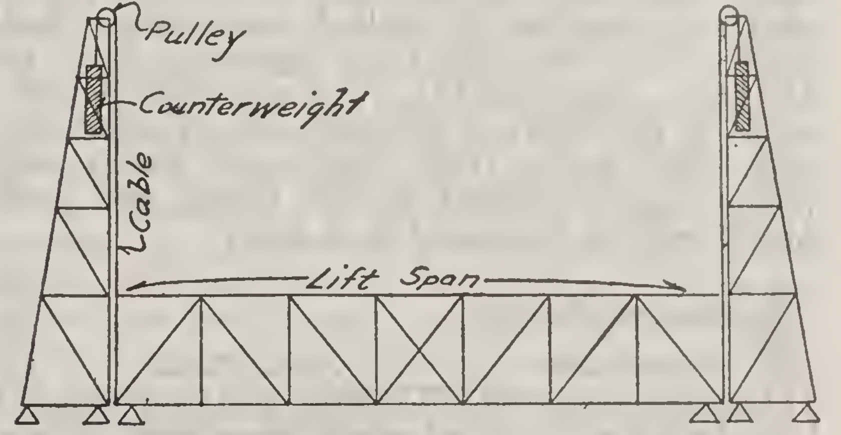

Fig. 15.— Direct Lift Bridge.

Cantilever Trusses.— The development of the cantilever bridge was an attempt to avoid the disadvantages of the continuous structure, and unlike the latter, a slight settlement of the supports is not followed by a great increase in stresses. It is not suitable for short spans where the live load is large in comparison with the dead load, for in such a structure the stresses in the anchor arm as the load travels on the structure require a large amount of metal. As the ratio of dead load to live load increases, the cantilever becomes more economical, for some of the dead load stresses are large enough to prevent reversal by the live load. Hence the cantilever system is best adapted for use in long spans, or where the simple truss or arch is difficult of erection, for the cantilever may be erected with very little falsework by building it out panel by panel. In form the chords of the anchor and cantilever arms may be straight, like those of Fig. 16, or curved to give the appearance of a suspended structure, and various arrangements of the web members are to be found in modern trusses. The suspended span is usually one of types of simple trusses heretofore described.

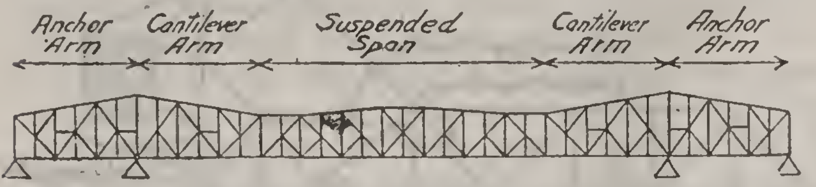

Fig. 16.— Cantilever Bridge.

Girder Bridges.— The simplest form of a girder bridge consists of two timbers spanning an opening and supporting a plank floor. For more permanent construction, longer spans or heavy traffic, modern girder bridges are built either of steel or reinforced concrete.

Rolled steel shapes, such as I-beams and channels, are used as girders or beams for short spans, and built up sections known as plate-girders consisting of rolled steel plates and angles have been used for spans as high as 130 feet. (See Fig. 17). The plate-girder indicated in the figure is a comparatively light section. For heavy traffic additional angles and plates may be added to the flange and web plates may be increased in number.

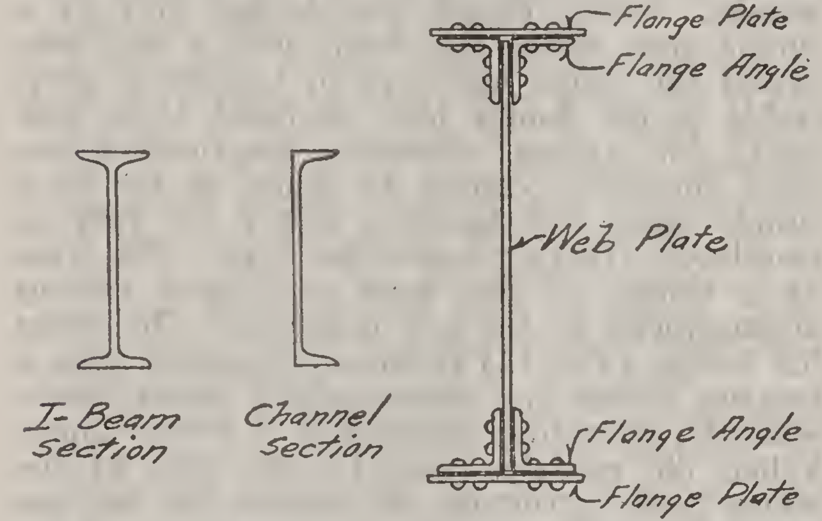

Fig. 17.— Plate-Girder Section.

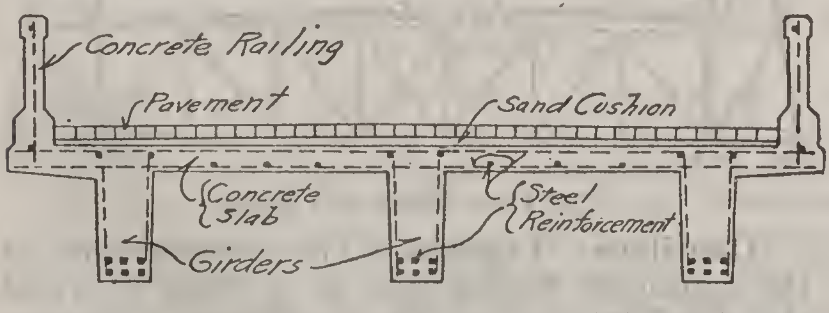

Fig. 18.— Reinforced Concrete Deck Girder Bridge.

In the last decade reinforced concrete girders (see Figs. 18 and 19) have been used extensively for short spans. They make a more rigid and more permanent structure than those built of steel, although their first cost is usually somewhat greater. The sections illustrated are such as are used for heavy country highway traffic. Reinforced concrete slabs without girders are often constructed for the shortest spans. The deck type may be widened to any desired width, sidewalks may be supported on cantilever brackets or additional girders, and provision may be made to carry street railway tracks. Reinforced concrete slabs and girders have also been used for short-span railroad bridges, where a permanent and artistic structure was desired, but where the vertical clearance or the soil conditions would not allow the construction of a concrete arch.

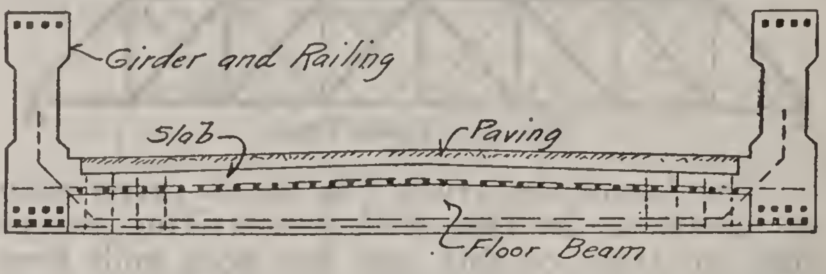

Fig. 19.— Reinforced Concrete Through Girder Bridge.

Both steel and reinforced concrete girders may be used in continuous and cantilever construction, while the former is often used for the leaf of a bascule or the movable span of a direct lift bridge.

Bridge Floors and Floor Systems.— The floor is that part of a bridge which directly supports the live loads. The floor system is that part of the structure which supports the floor and transfers the loads to the trusses, girders or arches. In a «deck bridge» the floor system is attached to the upper chords of the trusses at the panel points, or to the upper flange or top of the girders, while in a «through bridge» the floor system is supported at the lower chord, or near the lower flange or bottom of the girders. There are some instances where a bridge has two floors, and such a structure is known as a «double deck bridge.»

In railway bridges two main classes of floors are used viz., the open floor and the solid floor. The usual type of open floor consists of cross-ties separated five or six inches and supported on «stringers» in the case of through spans and in most deck truss spans, and on the girders or trusses in the case of short deck spans. Where stringers are used they transfer the loads received from the cross-ties to «floor-beams» which are supported either between or upon the trusses or girders. With short panels the stringers may consist of I-beams, but usually both stringers and floor beams are plate-girders. Fig. 20 is a skeleton diagram of a portion of the open floor and floor system of a through railway truss bridge.

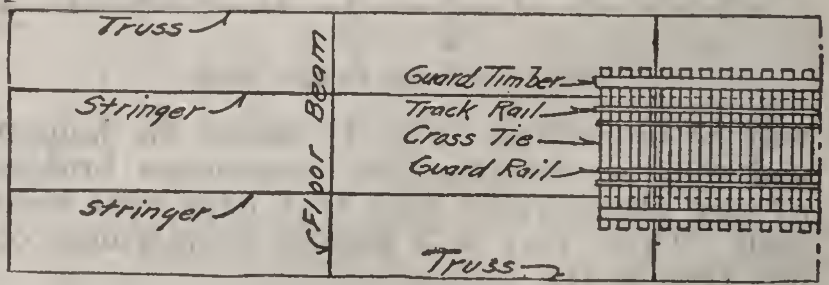

Fig. 20.— Open Floor.

Solid floors indicate by their name a non-open construction, and usually carry ballast such as is used on the rest of the track. Where no provision need be made for drainage a solid flooring of creosoted timbers may be laid on the stringers, girders or trusses and upon this is spread the ballast in which the track ties are laid. Various kinds of so-called trough floors were among the first types of solid floors to be built. These (see Fig. 21) were built up of different steel shapes and sections and resting upon the stringers, floor beams, girders or trusses, either carried the ties directly or supported the ballast in which the ties were laid. Floors of this kind are seldom constructed at the present time. The latest trend has been toward a type where concrete is the predominant feature.

In through girder bridges where more examples of this type of floor are to be found, there are two general systems. In one the floor beams which are rolled I-beams are spaced very close together (from 12 to 24 inches) and completely encased in concrete. The beams are designed to carry the whole load and the concrete serves as protection and filling only. In the other the floor beams are somewhat farther apart and support a reinforced concrete slab. In either case there is a surface of concrete upon which the ballast and ties may be laid.

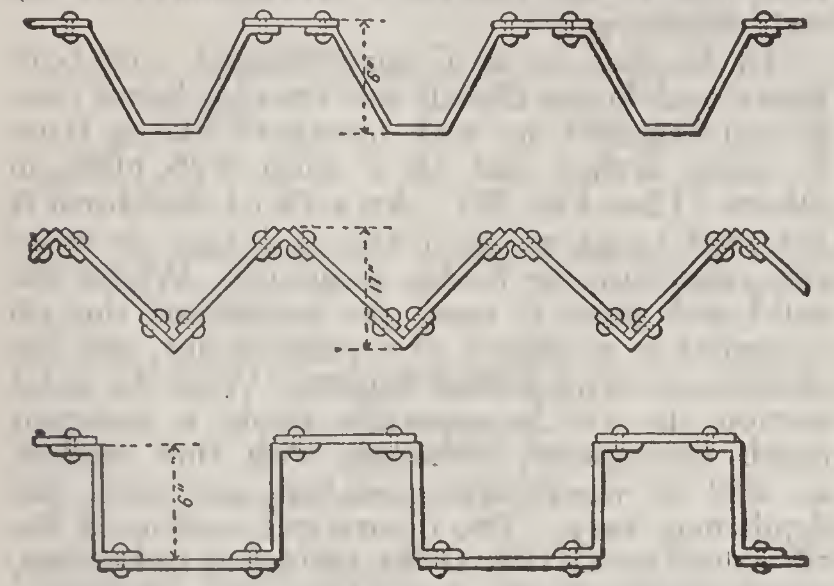

Fig. 21.

Previous to 1900 few highway bridge floors were made of other material than wood. A common type of floor for country highway bridges is illustrated by Fig. 22. Planks resting directly on the stringers were fastened down by nails to nailing pieces which were bolted to the stringers. In some cases a floor was laid as indicated by Fig. 22 and another one, called a wearing floor, was put on top of it. All wooden floors have the disadvantage of being difficult to attach to the stringers so that they will remain secure and not be jarred loose by traffic.

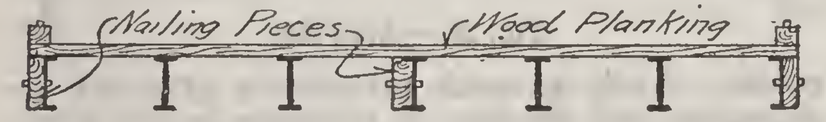

Fig. 22.— Wooden Floor.

Fig. 23 illustrates another type of floor which allows the pavement of the adjacent roadway to be carried without a break across the bridge. Creosoted timbers packed close together are bolted on the stringers and support the pavement and intermediate sand cushion. A more modern and more permanent floor can be made by the substitution of a reinforced concrete slab in place of the floor timbers, and except in instances where the additional dead load weight of such a slab would be markedly disadvantageous, this type is preferred.

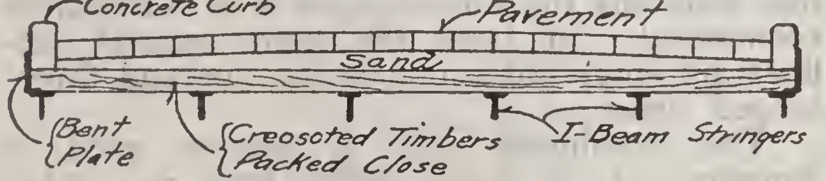

Fig. 23.— Brick Floor.

A large number of floors are built as indicated by Fig. 24, with the I-beam stringers spaced somewhat closer together than in the type shown by Fig. 23, and designed as in the case of railroad structures to carry the whole load, the concrete serving merely as protection to the beams. The concrete may be covered with earth for a depth of a few inches or any type of modern pavement may be used.

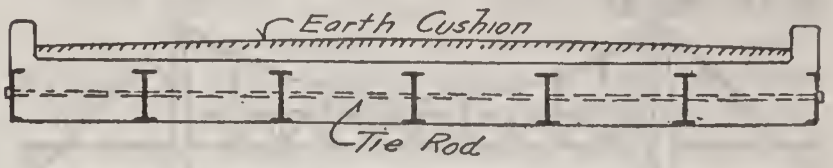

Fig. 24.— Plain Concrete Floor.

As shown by Figs. 18 and 19, the floor of a reinforced concrete girder bridge is similar to one of the floors described above, the slab being part of the bridge itself.

Bracing.— Between the two or more trusses or girders forming a bridge a large number of struts, or ties and struts, are required to hold the truss in position and make the structure stiffer and less subject to vibration. In modern practice most of the bracing is designed to take both tension and compression as experience has shown that greater stiffness is obtained in this manner.

The bracing between the end posts of through bridge trusses is known as the «portal bracing» while the vertical or inclined bracing between other web members of one truss and the corresponding members in the other truss is called the «sway bracing.» The horizontal bracing between the chords of the trusses is referred to as the «upper lateral system» or «lower lateral system» respectively.

In a through truss bridge, when the depth of the trusses is not sufficient to permit the construction of the portal, sway and upper lateral bracing, the trusses are known as «pony bridge trusses.» Such bridges have very little lateral stiffness and consequently are used only for light traffic and short spans.

In through girder bridges the floor system itself is constructed to serve the function of the lower lateral system and the upper flanges of the girders are stiffened by riveting heavy brackets or gussets to the tops of the floor beams and the sides of the girders. In deck bridges the portal and sway bracing are often referred to as «cross-frames,» and extend the full depth of the trusses or girders.

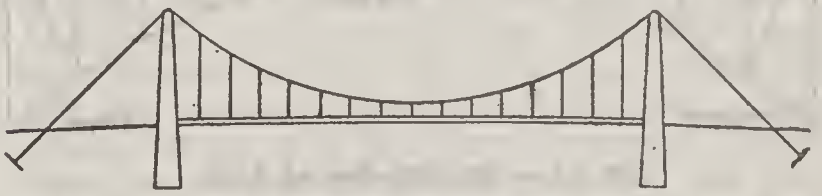

Fig. 25.— Suspension Bridge.

Suspension Bridges.— Fig. 25 shows the skeleton diagram of a suspension bridge. Cables anchored at the ends are carried over towers and the bridge floor is hung from the cables by means of vertical suspenders. In the modern suspension bridge the bridge floor cannot be hung directly from the cables, for the moving of a heavy load across the bridge would cause the cables to sag first at one point and then another, giving a kind of wave motion as the load passed over the structure. A more equal distribution of the load is effected by the use of stiffening trusses. (See Fig. 26). These trusses are hung from the cables and the bridge floor or floors is supported on them. When well braced together such a system resists the horizontal swinging which may be caused by the wind.

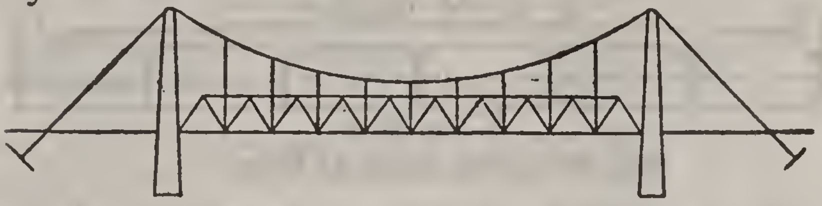

Fig. 26.— Stiffened Suspension Bridge.

The lack of rigidity of a suspended structure generally renders it unsuitable for short spans except for light traffic. While the addition of stiffening trusses and bracing may result in sufficient stiffness, the increased expense usually makes the cost of the structure greater than that of simple trusses. Even for longer spans the proper degree of stiffness cannot be secured except at such an expense as to render it more costly than a cantilever. Since long spans cannot economically be built for light traffic, the suspension system seems to have its principal economic advantages for long spans under heavy traffic where the dead load is large in comparison with the live load, and consequently assists in making the structure a rigid one.

The suspension bridge can often economically be constructed for foot traffic, or where the possibility of future heavy traffic is debatable. In the latter instance considerable expense may be saved by constructing this less rigid type, which may satisfactorily care for the traffic for many years.

Arch Bridges.— A beam or truss bridge under vertical loads has only vertical reactions, provided proper provision is made at one or more of the supports for a horizontal movement due to the deflection of the bridge and to changes in temperature. When the reactions are inclined under vertical loads the bridge becomes an arch. The vertical loads on an arch produce a horizontal thrust at the ends equal to the horizontal component of each inclined reaction. The thrust may be resisted either directly by the abutments or by a tie uniting the two supports.

Steel arches are divided into three classes, based on the number of hinges each truss or rib contains. The simplest form has three hinges, one at each support and one at the crown. When two hinges only are employed they are placed at the skewbacks or supports. The third class of arches has no hinges and its ends are usually fixed rigidly to the abutments or piers.

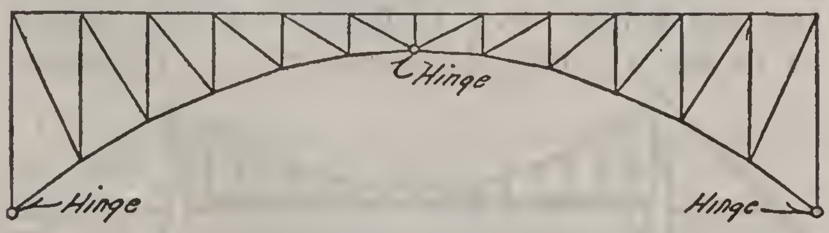

Fig. 27.— Spandrel-Braced Arch.

The form of three-hinged arch most frequently adopted for bridges is a horizontal upper chord and a bent lower chord united by vertical and diagonal web members as indicated in Fig. 27. Such an arch is designated as spandrel-braced. The hinge at the crown is generally placed in the lower chord and only infrequently in the upper chord or midway between them, although in either of the latter positions the stresses throughout the structure are somewhat less. The explanation of the above lies in the fact that the placing of the hinge in any position other than in the lower chord seems to detract from the good appearance of the structure, due to the necessary arrangement of the web members.

In another form of three-hinged arch both upper and lower chords are curved, being connected together by web members like a truss in some arches and by a solid web plate in others. (See Fig. 28). An arch of this form is referred to as an arch rib, and two or more ribs constitute the bridge structure. Where the solid web plate is used, the section of the rib is similar to a section of a plate girder, and the chords are often called flanges. With the solid section the rib is generally made a constant depth throughout, although with this section, as well as where web members are used, the depth may vary. The theoretical outline of the rib would be narrow at the springing and crown, with greater depth at the haunches. Such an outline is not graceful, however, and is seldom used. In some of the more recent and heavy structures the ribs gradually increase in depth from the crown toward each springing or skewback, having the maximum depth at the latter points. Such an arch presents a graceful appearance, and the loss in economy is not great. The floor of the bridge is supported either on columns carrying the load down to the ribs or on suspenders hung from the ribs.

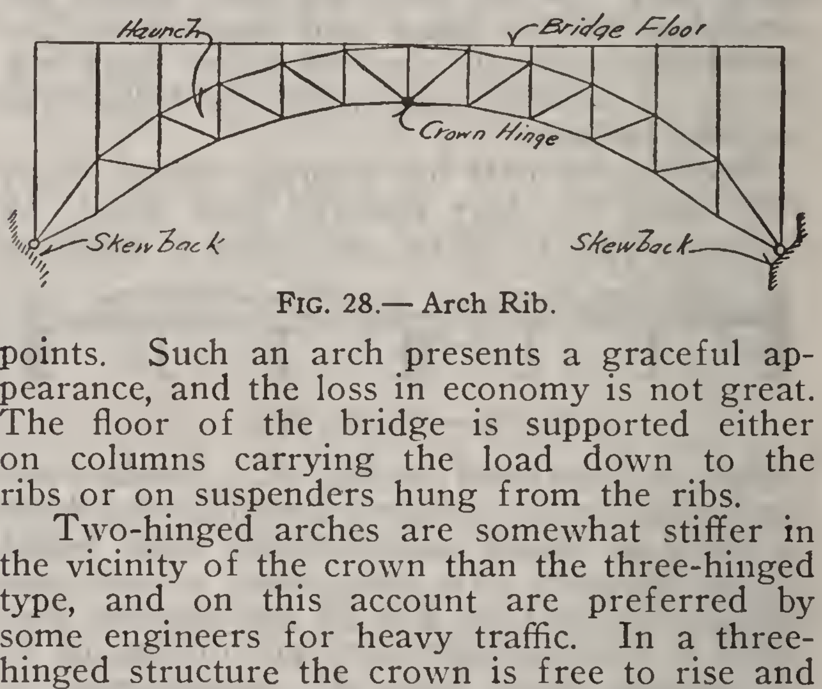

Fig. 28.— Arch Rib.

Two-hinged arches are somewhat stiffer in the vicinity of the crown than the three-hinged type, and on this account are preferred by some engineers for heavy traffic. In a three-hinged structure the crown is free to rise and fall due to the expansion or contraction caused by temperature changes without producing any bending stresses in the members, but with the crown hinge omitted, such bending stresses may be large. The additional material required to resist these stresses may be considerable, so that generally the three-hinged arch is the more economical. In form the same general outlines are employed for both the two and three-hinged types.

The no-hinged arch is seldom used in America. It is much stiffer than any other type, but this fact in itself is a disadvantage on account of the very large bending stresses caused by changes in temperature, particularly at the supports. Another disadvantage is the difficulty in constructing absolutely unyielding supports, for any movement of these produces additional bending stresses throughout the arch. Consequently arches of this type are not adapted for spans of any great length, and there are few in existence.

Concrete Arches.— For the shorter spans where the supports can economically be made unyielding, the concrete arch presents a structure not only very pleasing to the eye but at the same time of more permanent character than one of steel. Earth-filled arch bridges (see Fig. 29) are suitable for short spans or for long spans of relatively low rise, where the dead load weight of the earth fill is not excessive. For the longer spans of higher rise the open spandrel construction (see Fig. 30) is usually adopted. Here a reinforced concrete structure, similar to those shown in Figs. 18 and 19, is supported on columns which carry the load to the arch itself. While more complicated in construction, the saving in dead load weight may be considerable, and the opportunity afforded for artistic treatment is increased. In some instances the arch ring extends the full width of the bridge, while in others the structure consists of two or more ribs, each carrying its proportion of the floor load, and braced together so as to act as one structure. See Concrete Construction.

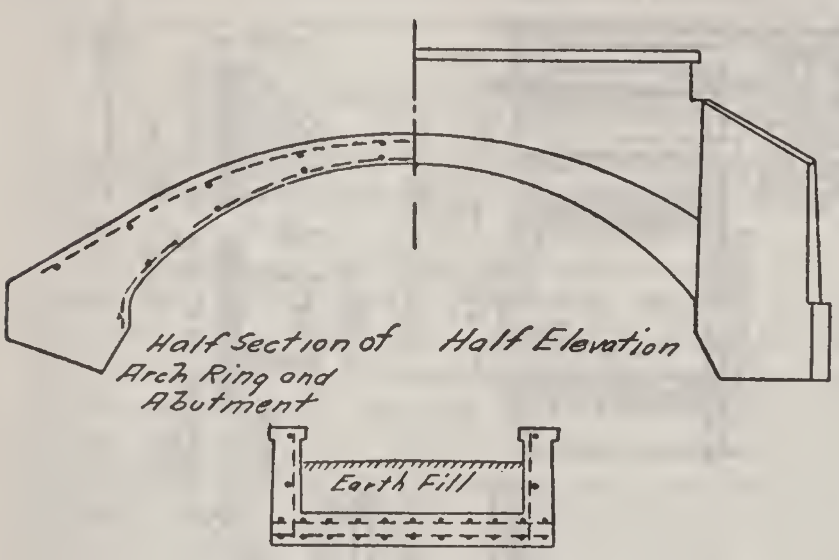

Fig. 29.— Earth-Filled Arch.

The arch rib may or may not be strengthened by the embedment of steel reinforcement in the concrete. Where used, this reinforcement may consist of a steel arch, built up of rolled steel sections, or single rolled sections, or of reinforcing bars. The modern trend has been toward the use of the reinforcing bar and the elimination of the more complicated forms of reinforcement.

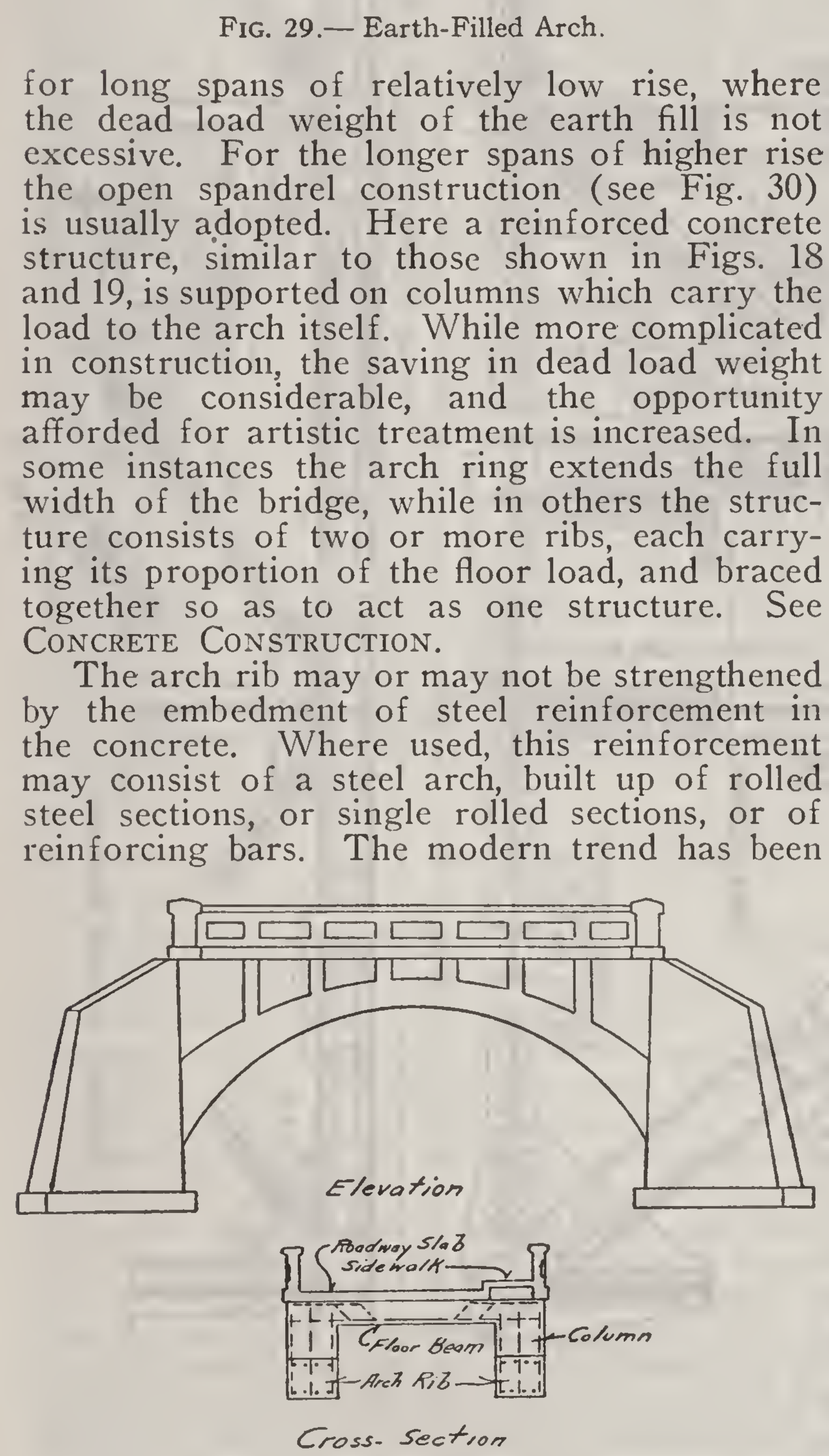

Fig. 30.— Open Spandrel Arch.

In arches of relatively high rise, the stress under dead load only is at every point compression. Where the dead load is comparatively large the possible tensile stresses due to the live load and changes in temperature may not be sufficient to cause the resultant stress to be tension at any point. In such arches no reinforcement is needed, except such as may be placed to prevent local shrinkage and temperature cracks.

Flat arches, and those where the dead load is not predominant, are subject to tensile stresses at some points under certain combinations of the loads and changes in temperature, and hence must be reinforced with metal, as concrete alone is capable of resisting but a slight amount of tension.

Details of Steel Trusses.—Members of steel trusses are usually constructed of rolled steel shapes either singly or in combination. Pin-connected trusses have at each panel point or joint a steel pin or round bar passing through holes in the chord and web members, and transferring the stresses from one member to another, by means of the shearing and bending stresses generated in it. Riveted trusses have their members joined together by rivets, which either pass directly through the several members at the intersecting joint, or which join each member to a common special connecting plate or plates. Such a joint has great stiffness, and when the truss deflects, this stiffness, since it prevents the members from rotating separately at the joints, causes large additional stresses in these members. Such stresses are known as «secondary stresses.»

In the early days of steel bridge construction, with the comparatively light traffic and slow speed of that time, the pin-connected structure was the more suitable for all but the shortest spans. As the weight of the traffic and its speed increased, the vibration of the pin-connected structure of short span became a serious factor, and the maximum span of riveted trusses has steadily increased. The length of span at which it seems desirable to select a pin-connected truss is dependent upon the relations of dead and live load. Where the dead load is comparatively large, the vibrations caused by the moving load may not be serious and the pin-connected truss with its low secondary stresses may be preferred. Where the traffic is very heavy the riveted truss may be desirable, and by bending the members before erection, so that under the maximum stress from the live load they will assume their normal positions, the maximum primary and secondary stresses can be prevented from occurring simultaneously. Such bending of the members is, however, very costly, while the connecting plates for heavy and long trusses must be enormous, so that pin-connected trusses with heavier members may be the more economical. The longest riveted simple truss in America at present has a span of 425 feet, while one in Europe has a span of 610 feet. The continuous span shown in Fig. 13, each span being 775 feet, has riveted connections throughout. Such riveted spans are, however, somewhat longer than the average maximum limit for this construction, but the tendency in the direction of long riveted spans is steadily growing.

For riveted trusses the members are built either of rolled steel angles or channels, or of combinations of angles and plates. Fig. 31 is a partial detail drawing of a riveted truss bridge of a rather simple type. In heavier and longer trusses the sections of the members are correspondingly heavier, and composed of a larger number of plates and shapes riveted together in various forms. Pin-connected trusses omit the plates indicated at the joints in Fig. 31 and substitute the pin or round bar referred to above, while the members subject to tension only are composed of one or more eye-bars. (See Fig. 32). Almost all trusses and some girders transfer the load to their supports through a pin, having its bearing in a shoe. The shoe is either of cast steel or built up of plates and angles like the one shown in Fig. 31.

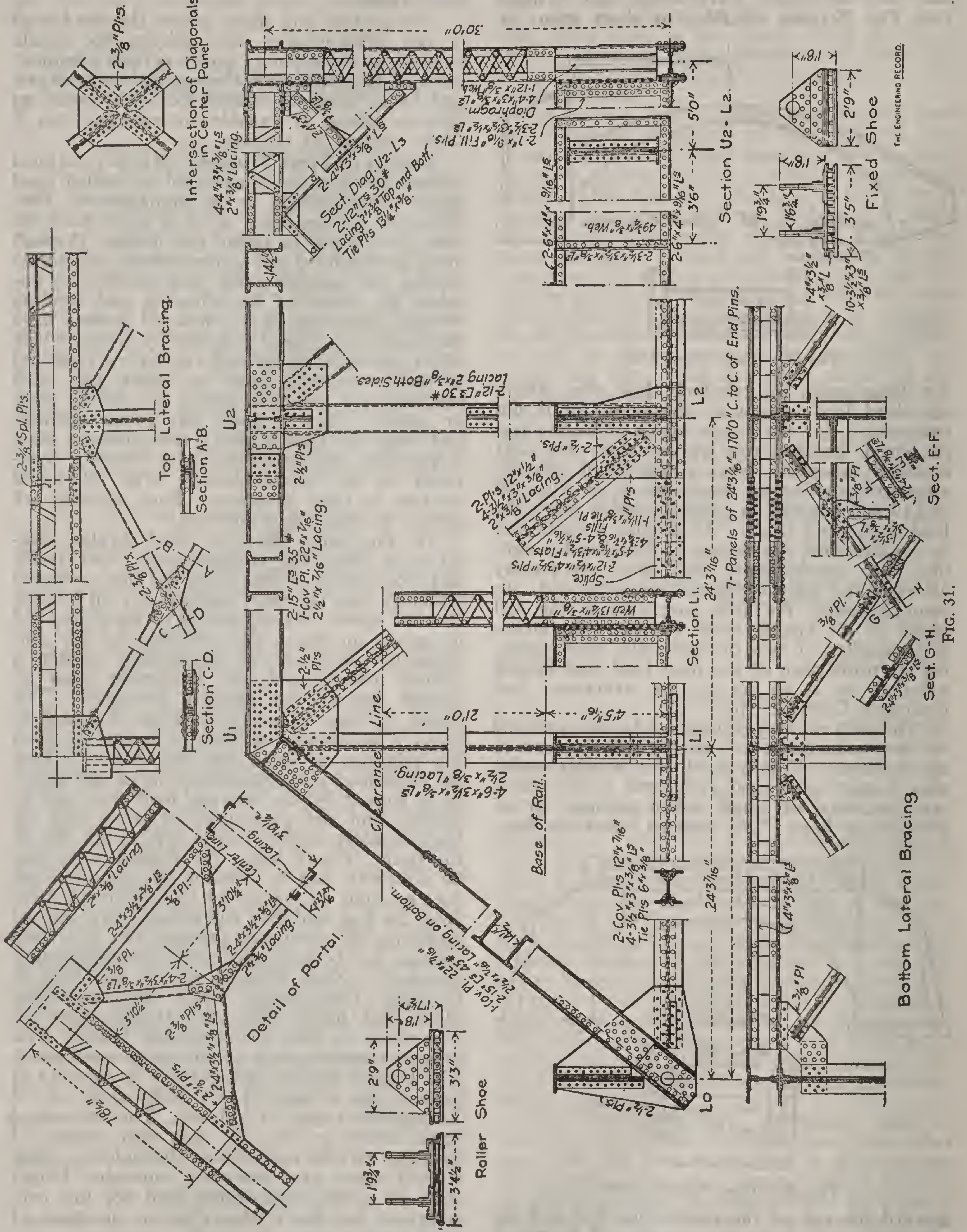

FIG. 31.

Arches have the same general details as trusses. The hinges consist of a pin against which the arch or half-arch has a semi-circular bearing and around which it is free to rotate.

The steel most frequently used for bridge structures at the present time is commercially known as «structural steel.» Technically, this grade is a rather low «medium steel» and is capable of withstanding a stress of about 60,000 pounds per square inch before failure. There is no reason why a true medium steel having an ultimate strength of about 66,000 pounds per square inch could not be used, except that the steel manufacturers prefer to furnish a softer steel.

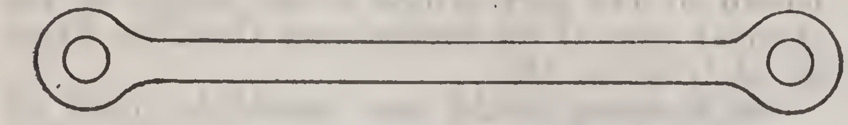

FIG. 32.— Eyebar.

In some of the longer structures an alloy steel has been used. A nickel chrome alloy known under the name of Mayari steel which is manufactured from Cuban ores containing both nickel and chrome very nearly in the right proportion to produce bridge material of excellent quality has been found satisfactory. Nickel steel is artificially produced by the addition of from 3 to 4 per cent of nickel. Both of these alloy steels are capable of withstanding a stress of more than 100,000 pounds per square inch, but they are somewhat more expensive per pound.

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BRIDGE DESIGNS, Railway. Bridges have been in use from prehistoric times. Even the scientific forms, now looked upon as most modern, were developed in a crude way by the ancients, timber cantilever structures being built by the Chinese in the time of Confucius.

Bridge design, of necessity, continued in an elementary stage as long as timber and masonry were the only materials in use, and long spans were impracticable with such materials, though the «Towne» lattice spans, built entirely of plank connected with hard-wood pins, were as nearly perfect as was possible without the use of iron, and some of these spans are still doing effective duty after 90 years of continued use.

The earliest use of iron in bridges began with the use of cast-iron posts and cast-iron arches, but this material was not found entirely satisfactory for long-span bridges. The first real development began with the use of wrought iron, which was first used in this country in vertical tension members in the «Howe» truss about 1840, and in inclined tension members in the «Pratt» truss about 1845. The use of wrought-iron tension members with wood and cast-iron compression members continued until about 1860, when Howard Carroll, an Irish engineer, assistant to Chief Engineer Gray of the New York Central, introduced the riveted lattice bridge, built entirely of wrought iron, which was developed by his successors on that road and used until very recent years. Wrought-iron plate girders were also first built about 1860.

J. H. Linville, between 1850 and 1860, introduced on the Pennsylvania Railroad a type of truss with flat diagonals and hexagonal rolled-iron posts, and about this same time Bollman and Fink introduced on the Baltimore & Ohio their multiple suspension types of trusses with flat diagonals and vertical iron posts. John W. Murphy adopted Whipple's ideas and developed a truss on Whipple's lines with cast-iron posts and square bar tension members with loop eyes.

A long step in the evolution of properly designed compression members was made by David Reeves about 1864, when he began the use of the rolled iron, round segmental «Phœnix» column, and about that date he also developed the hydraulic upset-end on tension members, which were made by the Phœnix Iron Company, first on round rods and afterward developed into eyes on flat bars, and these two features were combined in the «Phœnix» bridge, which was far in advance of any bridge construction at that date and quickly came into very general use. While it still preserved the use of cast iron for connections, it permanently did away with any further use of cast iron for compression members, and its simplicity and ease of erection made it by far the best type developed up to that time. Many of these bridges are still in use, and those that have been replaced have generally been removed on account of the great increase of rolling loads to be carried, and not on account of inherent defects in the design.

With the use of «eye bars» the pin-connected type of truss came into practically universal use in this country, since it had great advantages over riveted bridges in many respects; but owing to its ease of erection, it was in many cases carried to ridiculous extremes, and spans as small as 25 and 30 feet were constructed with individual members so light and insignificant that the structure had no rigidity. In recent years there has been a very general disuse of this type of construction for spans under 150 feet, and the best engineering practice now calls for riveted structures for small spans, though American engineers still use the pin-connected type for long spans almost universally.

The general principles of railroad bridge construction have not undergone much change in the last 20 years, as practically all spans are built on the general lines of the «Pratt» truss, with vertical compression members and inclined tension members, or on the lines of the «Warren» truss, with all main web members inclined; but the constantly increasing weight of the locomotives in use has tended to the use of heavier and more rigid structures with long panels and as few members as possible, more substantial details, solid floors, stiff lateral and vibration bracing and other features of present engineering practice, which reduce vibration and add to the rigidity of the structure.

The rapidly increasing capacity of American bridge-building shops and their ability to fabricate and handle single members of sizes impossible to obtain a few years ago, has enabled the American engineer to design bridges with practically no shop limitations, and he has thus been free to make designs solely with the idea of producing a structure with the maximum strength and rigidity and the minimum weight of material.

The rapid advance thus brought about would have been impossible had not the ingenuity of the erecting engineer kept pace with that of the designing engineer, but this specialty of erection has reached such an advanced stage that spans of 1,800 feet, with single members weighing 120 tons, are now erected as rapidly as any smaller span.

One of the recent tendencies of American practice has been to substitute plate-girder spans for all short bridges, in place of the various types of lattice girders and pin-connected spans heretofore in general use, and very few engineers use any type of steel structure except a plate girder for spans under 90 or 100 feet. Some engineers prefer this type for spans as long as 125 feet. To summarize general practice, it can be said that this type of span is used for spans from 20 to 100 feet, spans under 20 feet being either arches or rolled beams, and spans over 100 feet running into riveted trusses. Plate girders are frequently built with solid floors, with the ties bedded in ballast, and the latest floors of this kind are built of reinforced-concrete slabs or arches, as the older trough floors and buckle-plate floors have been found unsatisfactory, owing to the impossibility of preventing rapid deterioration from rust. Plate-girder spans over 70 feet long generally rest on pin bearings at each end, to allow for deflection, and have cast-steel end shoes.

The usual present practice is to build all spans between 100 feet and 175 feet with riveted trusses, and the old style, multiple-intersection riveted span has entirely given way to the riveted, single-intersection truss with long panels. For deck spans, the old practice of supporting the ties directly on the upper chord has largely disappeared, and either a solid ballasted floor is used, or a regular floor system is laid, consisting of cross floor beams resting on the upper chords, and logitudinal stringers framed between floor beams.

For through spans the ordinary practice is to use a floor system with cross floor beams riveted in between the vertical posts and longitudinal stringers riveted between the floor beams, but in many cases a solid ballasted floor is used, in which case the lower chords are reinforced against bending by supporting them at their middle points from a sub-panel in the truss or by making deep lower chords capable of withstanding the bending in addition to the direct stress.

Spans over 175 feet are usually built with pin connections and, where the span is long, the upper chord is generally curved so as to give a maximum depth at the centre and truss depths are proportioned so as to give a practically uniform upper chord section throughout. Upper and lower laterals and transverse bracing are now universally built of riveted members, and the older form of tension rods used for purposes of wind and vibration bracing has entirely disappeared. Simple truss spans of this character have been built to a maximum length of 710 feet, which is the length of the channel span of the bridge over the Ohio River at Metropolis, Ill.

Such spans could and would be built of much greater length if it were not for the fact that in navigable rivers of a magnitude requiring such spans, the government will not allow the waterway to be even temporarily obstructed with falsework, so that for long spans it is often necessary to use a cantilever or some other type of structure that can be erected without placing any obstruction in the main channel.

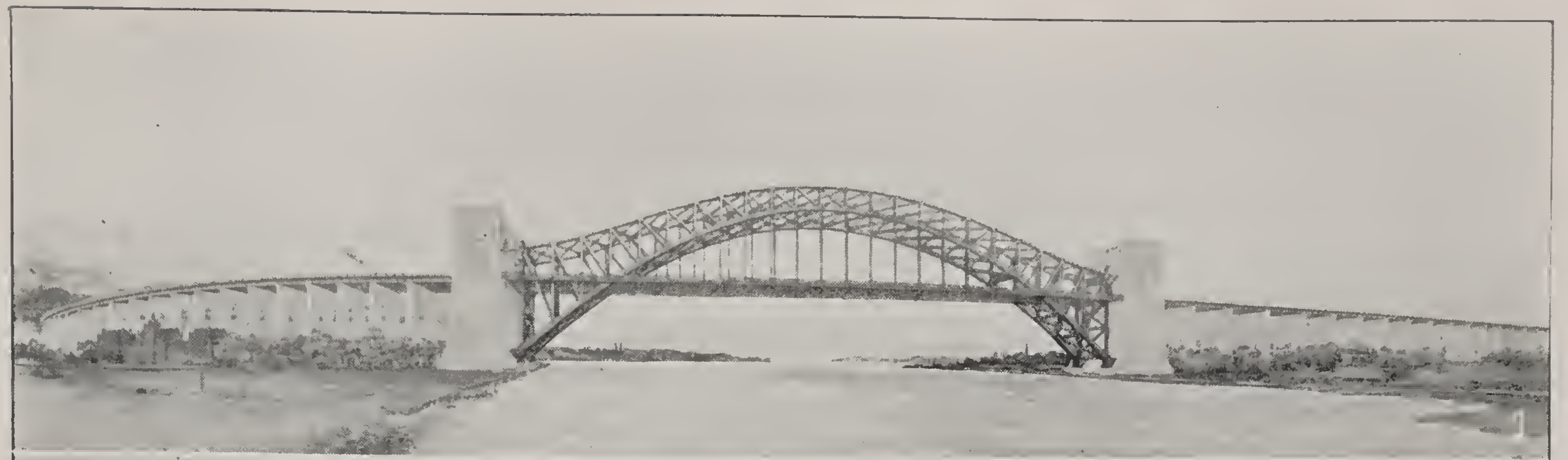
Spans continuous over one or more piers have not been generally adopted in this country, though they are used to a considerable extent in Europe. The two notable American examples of this type of construction are the Queensborough cantilever at New York, which is a five-span continuous structure, and the bridge over the Ohio River at Sciotoville, which is built with two spans of 775 feet, continuous over the centre pier.

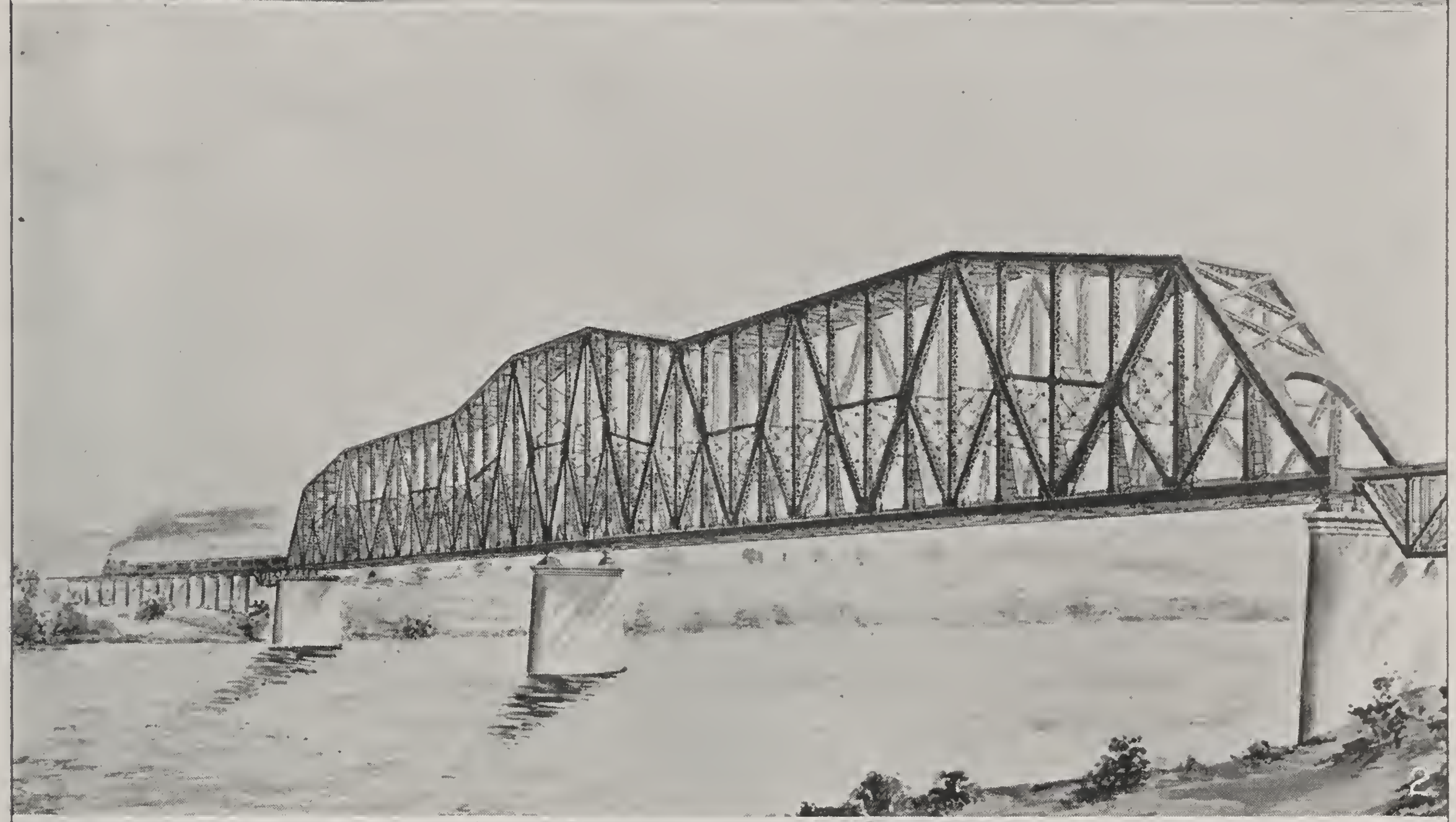
In draw spans, the recent changes in practice have been in the same direction as for through spans, as far as the trusses, floor and bracing are concerned. The practice of counter-bracing the trusses by means of diagonal counter-rods has been abandoned, and stiff riveted diagonals are used, capable of carrying either tension or compression where reverse stresses occur. For draw spans of short span or in cities or other situations where there is not plenty of room for a swing bridge, the «rolling lift» bridge has been adopted and has proved most efficient. For long draw spans, the centre pier revolving span is still the type in common use, and for spans up to 400 feet a central pivot bearing is generally used. For spans over 400 feet a rim-bearing turntable drum rolling on a circle of conical cast-steel wheels has been found most satisfactory, and for very heavy spans two concentric drums and circles of wheels are used.

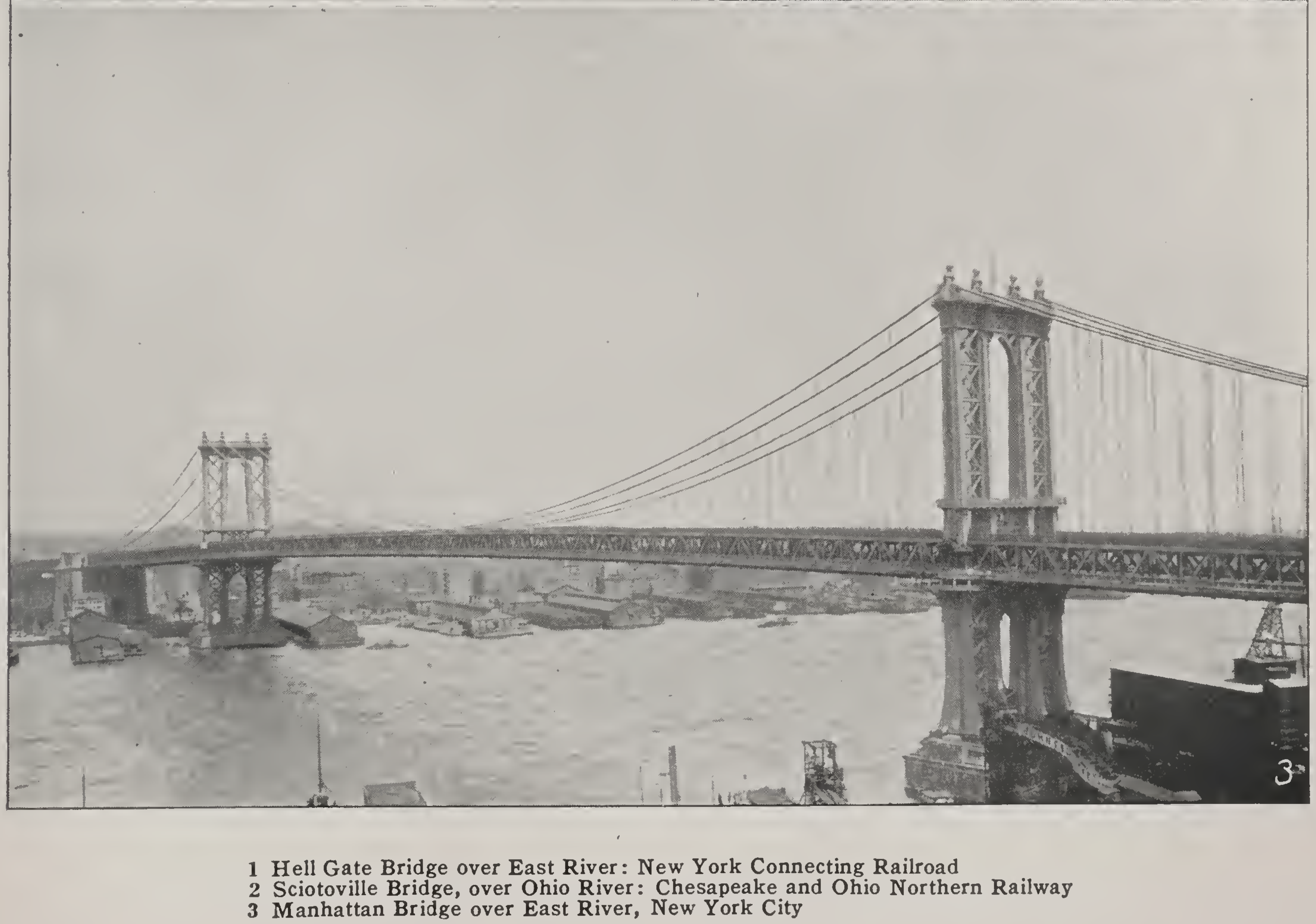
The use of steam as an operating power for swing bridges has almost disappeared, being replaced by electric motors, which are more economical and do away with many difficulties encountered in the use of steam engines and their boilers, though gasoline engines are in general use where electricity is not readily obtainable.

The metal arch bridge is a type of structure developed almost wholly in recent years, and there are various modifications of this type, some being built as spandrel arches, in which the web members connect a horizontal top chord with an arched lower chord, having the floor system supported on the top chord or framed in between vertical posts at the top chord level, while others are built as braced ribs, having both chords arched and connected together with the web members and the floor supported on vertical posts resting on the braced rib at panel points. Each of these types of arch spans is further varied by being built by some engineers with two pin bearings at

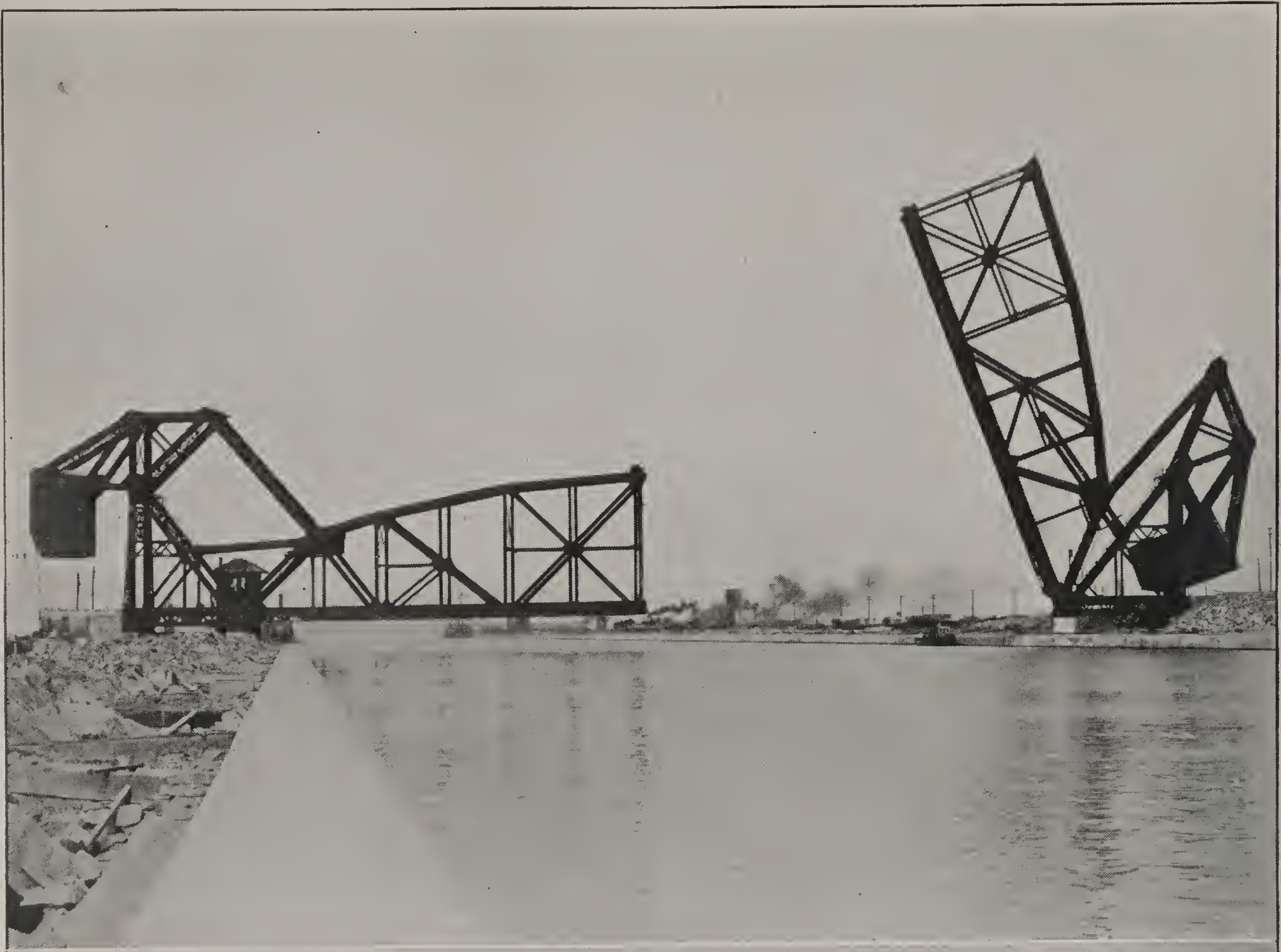
BRIDGES



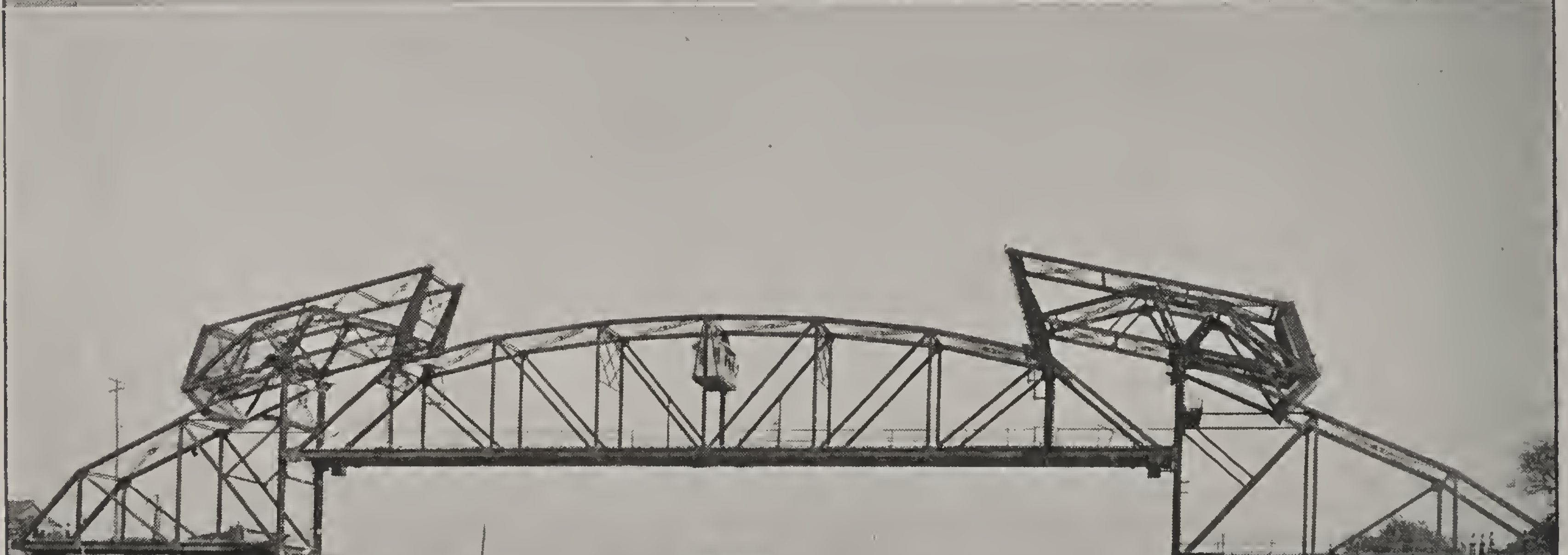




1 Hell Gate Bridge over East River: New York Connecting Railroad
2 Sciotoville Bridge, over Ohio River: Chesapeake and Ohio Northern Railway
3 Manhattan Bridge over East River, New York City



1 Double Leaf Trunnion Bascule for Heavy Traffic



2 Direct Lift Bridge in the Act of Opening

the two supports, and by others with the addition of a third pin bearing at the crown. It is contended by the advocates of two hinges that the omission of the centre hinge adds considerably to the rigidity of the span, but it has not yet been conclusively demonstrated that the third hinge adds appreciably to the vibration, and this third hinge disposes of the great uncertainty of temperature stresses and allows the exact calculation of the true stresses and sections by static methods, so that it has considerable advantage and is more in use than the two-hinged type. Many long spans have been built of this type, the longest span being the Pennsylvania Railroad bridge over Hell Gate, New York, which is a two-hinged spandrel arch carrying four tracks, with a span of 977 feet 6 inches as shown on Fig. 1. Suspension bridges have not been used for railroad spans to any great extent, as with wire cables and a stiffening truss along the floor line it is difficult and expensive to give them the necessary rigidity for such heavy moving loads. However, for very long spans where the dead load exceeds the live load they can be advantageously used, and in the most modern designs the cables have been designed of eye-bars in place of wire, which enables the stiffening trusses to be built along the cable and thus saves a very large portion of the weight. The depths of such stiffening trusses can be so designed that neither of the chords will carry compression, so that the only compression members will be the comparatively light web members. Recent designs for suspension bridges also use rocking or flexible steel towers with the cables made fast to their tops in place of rigid towers with cables supported on rolling shoes. The three suspension bridges over the East River between New York and Brooklyn are excellent types of the evolution of this type of bridge; the Brooklyn Bridge having stone towers, the Williamsburg Bridge steel towers, and the most modern, Manhattan Bridge, rocking steel towers. The Williamsburg Bridge is the longest suspension bridge in the world, having a span of 1,600 feet. Fig. 2 shows the design for the proposed bridge over the North River at New York, with a span of 2,880 feet to carry eight tracks and two roadways; this design shows the stiffening trusses along the cables.

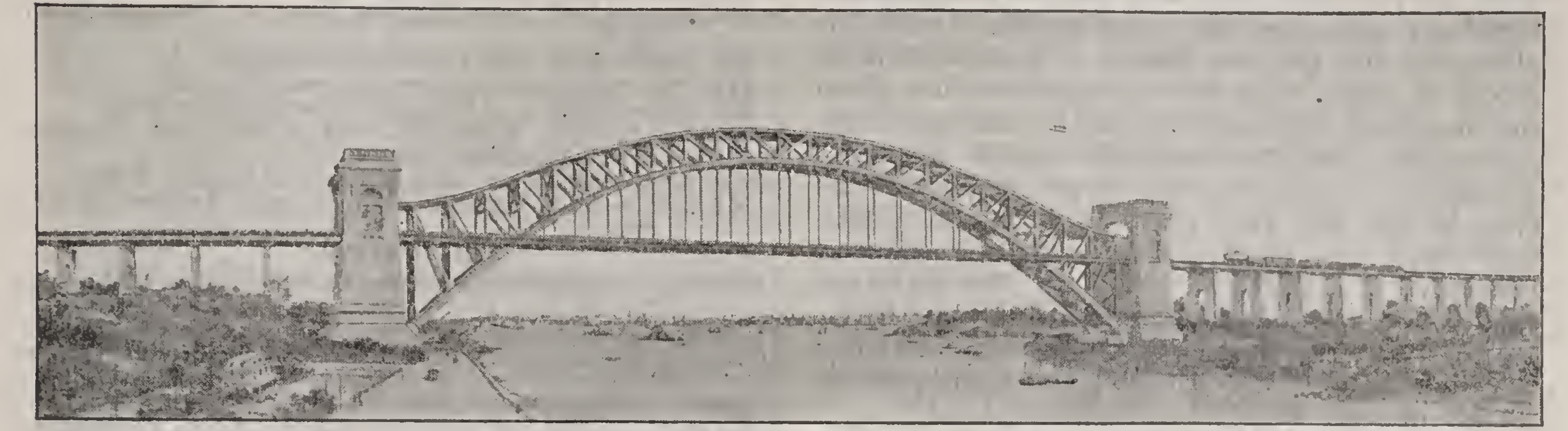


FIG. 1.—977-foot 6 inches Arch over East River, New York City. Hell Gate Bridge.

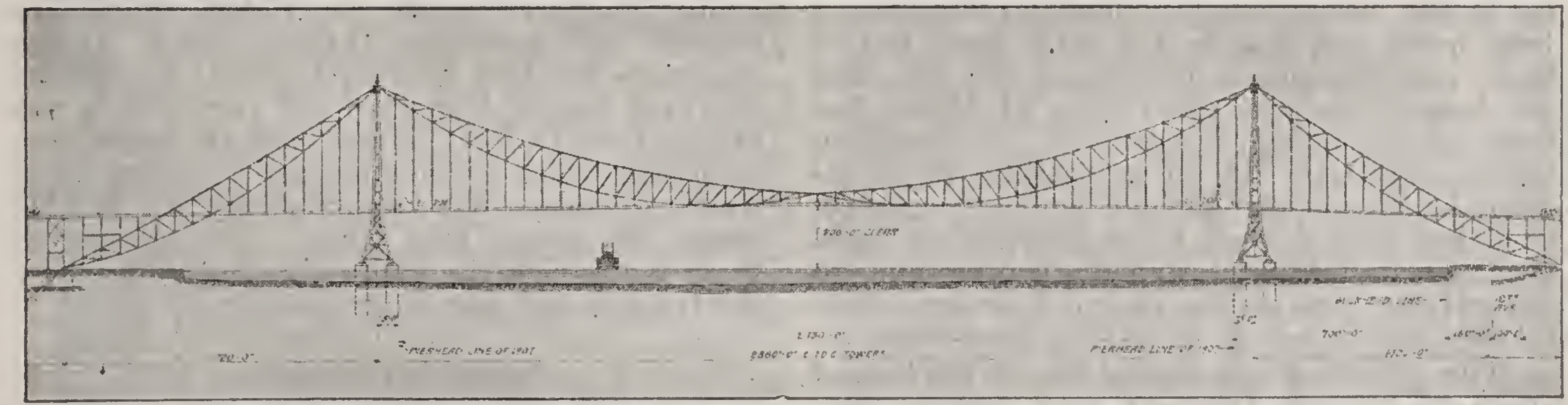


FIG. 2.—2,880-foot Suspension Span. Proposed North River Bridge, New York.

The cantilever bridge has come into very general use in recent years, not because of the economy in metal required, as this type weighs more than a simple truss or an arch of equal span, but because of the great advantage that it can be erected without putting falsework in the main channel. Since the government prohibits falsework unless there are several spans with sufficient channel depth for navigation this type is practically mandatory for long spans, as, if any other type is adopted, the span must be erected with additional material, causing it to act temporarily as a cantilever, and this additional erection material overbalances the saving of any type adopted. For this reason the cantilever has become the standard type for spans where falsework cannot be used, though for very long spans the suspension type is probably more economical. It is impossible to set a limit as to when the suspension type is lighter, but for ordinary railroad loads the cantilever is probably more economical up to spans of about 2,000 feet, and beyond that the suspension type would probably prove the better. The cantilever over the Saint Lawrence River at Quebec, having a span of 1,800 feet, is the longest span of any kind in the world.

Cantilever bridges are comparatively new, but even in the few years in which they have been in use they have been greatly improved in their general arrangement, details and erection devices. The capacity of the bridge shops to manufacture eye-bars as large as 16 inches by 2 inches and 83 feet long, centre to centre of eyes, with pin holes 13 inches in diameter, and heads as large as 36 inches in diameter, as well as to build and ship single compression members weighing 100 tons, together with the ability of the erecting gangs to put these huge pieces in place with moving travelers, has given the designing engineer practically unlimited opportunities, and has brought about the construction of several very large spans of this type in the last two years, notably the 1,800-foot span at Quebec, the 1,182-foot span at Blackwell's Island, N. Y., and the 812-foot span over the Monongahela River at Pittsburgh, Pa. The first two bridges are described elsewhere, and the Pittsburgh cantilever is shown in Fig. 3.

Stone arch bridges are an excellent type for short spans, where the owners can afford the first cost, as the repairs are practically nothing, but this type has not changed in recent years, though in the modified form of the reinforced concrete arch it is being introduced quite generally for ornamental bridges in parks and cities where the æsthetic requirements are more important than economy, and it is an excellent type for this use, but cannot be economically used for long spans carrying heavy loads.

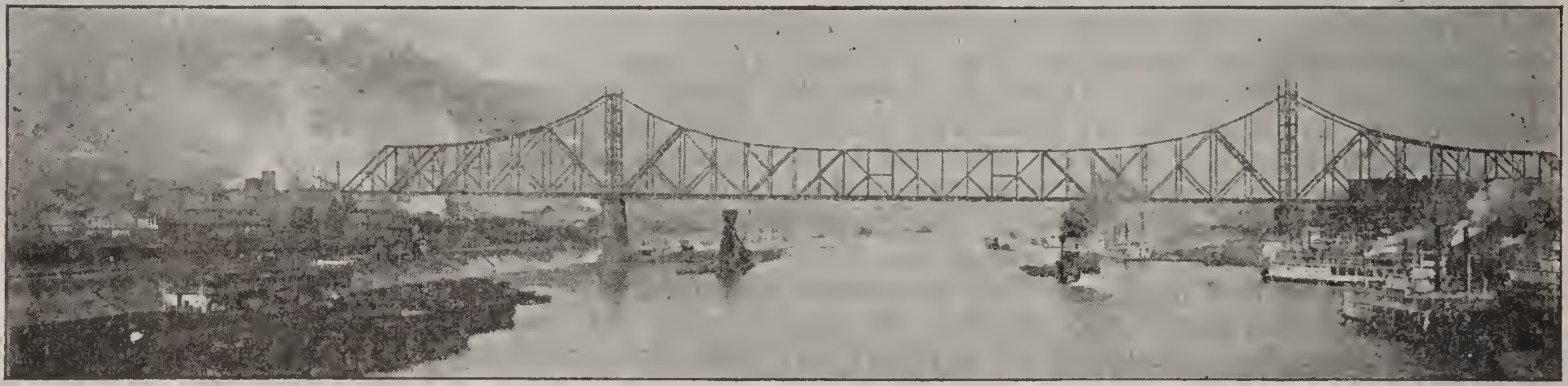


FIG. 3.—812-foot Cantilever Bridge over Monongahela River at Pittsburgh, Pa.

The many wide navigable rivers in this country have given the American bridge engineer unequalled opportunities to show his ability in the design, construction and erection of long spans, and that he has made good use of these opportunities is proved by the fact that the longest span of every type of bridge has been, or is being, constructed by American bridge engineers. In all probability the maximum length of span has not yet been reached, as it has been proved to be practical to build spans up to 1,800-feet, and there is nothing to prevent the construction of much longer spans, if they are found to be paying investments.

The following is a partial list of the largest spans of various types of steel bridges now built or building:

TRUSS SPANS

710 feet — Span over the Ohio River at Metropolis.
668 feet — Span over the Mississippi River at Saint Louis.
640 feet — Suspended span of the cantilever over the Saint Lawrence River at Quebec, Canada.
630 feet — Fixed span of the Blackwell's Island cantilever, New York city.
621 feet — Fixed span of the cantilever over the Mississippi River at Memphis, Tenn.
550 feet — Span over the Ohio River at Louisville, Ky.

DRAW SPANS

520 feet — Draw over the Missouri River at Omaha, Neb.
503 feet — Draw over the Thames River at New London, Conn.
491 feet — Draw over the Saint Louis River at Duluth, Minn.
415 feet — Draw over the Harlem River, New York.
336 feet — Double lift bridge over Sault Sainte Marie, Mich.

ARCHES

977½ feet — Arch over Hell Gate, New York.
840 feet — Arch over Niagara River at Niagara Falls, N. Y.
721 feet — Arch over Viaur River, France.
614 feet — Arch over Rhine at Bonn, Germany.
595 feet — Arch over Rhine at Düsseldorf, Germany.
591 feet — Arch Kaiser Wilhelm Bridge over Wuppur River, Mungsten, Germany.
550 feet — Arch over Niagara River at Niagara Falls.
541 feet — Arch Garabit Viaduct over Truyere River, France.

CANTILEVERS

1,800 feet — Cantilever over Saint Lawrence River at Quebec, Canada.
1,710 feet — Cantilever over Firth of Forth, Scotland.
1,182 feet — Cantilever over Blackwell's Island channel, New York city.
820 feet — Cantilever, Lansdown Bridge, India.
812 feet — Cantilever over Monongahela River, Pittsburgh, Pa.

SUSPENSION BRIDGES

1,600 feet — Span of Williamsburg Bridge, New York city.
1,595 feet — Span of Brooklyn Bridge, New York city.
1,470 feet — Span of Manhattan Bridge, New York city.

The Viaur Arch in France is not a true arch, as it is a combination of an arch over the central opening, counterbalanced by two semi-arches extending back over each of the shores.

The Arch spans over the Rhine at Bonn and Düsseldorf are through spans with the floor suspended from the arch ribs, while all the other arches are deck structures with the floor above the crown of the arch.

This list might be indefinitely extended and many structures might be added which are notable for particular features, such as the extremely flat arch of the Alexander III Bridge in Paris, having a span of 362 feet with a rise of less than 19 feet. Many viaducts might also be added, which are notable not from any great length of spans, but from the extreme heights above the gorges they cross. The greatest of these is the Gokteik Viaduct in Burmah, where the track is 825 feet above bottom of gorge.

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BRIDGE FOUNDATIONS. See FOUNDATIONS.

BRIDGE SHOPS AND SHOP PRACTICE. The working plant of a bridge building company is composed of shops and departments so arranged in their relation to each other that the movement of the material handled by them is continuous and in one direction — the rough material entering at one end of the plant and passing out as a finished product at the other. This arrangement ensures the reduction to a minimum the time lost in handling, and also the greatest possible economy in the cost of production.

Each of these shops is under the immediate charge of a foreman or superintendent who reports daily to the general superintendent or manager of the plant, who makes out the program of work, and prescribes the dates upon which the different pieces of work are expected to be completed, the desideratum being to keep the various shops continually working, and to complete the various parts of the bridges in the order in which they are required at the place of erection.

The buildings of the various shops are usually of fireproof construction and conform to the requirements of larger size, good lighting, heating and ventilation. They are connected by narrow-gauge railway tracks, which run lengthwise through them so as to facilitate the transportation of the material from one part of the works to another with the least amount of handling. Ample yard-room is provided at the ends of the buildings and also around them for the storage of partially completed material awaiting its turn for the finishing touches before shipment. These yards are usually laid out so that the carrying distance is as short as possible, and the work of carrying is accomplished by overhead traveling cranes.

These shops may be designated and described as follows:

(1) «Power Plant,» consisting of large batteries of boilers for generating steam, and engines for driving the dynamos through which power and light are furnished to all parts of the works, and other engines for operating the air-compressors which furnish the power for the portable pneumatic drills, riveters, hammers and reamers, and also the compressed air used for the draft of rivet furnaces, and blacksmith forges; for the cleaning of finished material, and for painting them by means of spraying devices.

In some cases, the hydraulic pumps and accumulators which supply the water to the hydraulic presses and riveters are also located in the buildings of the power plant, all the machinery of which is installed in duplicate so that an accident would not necessitate the shutting down of the entire plant during the time consumed in making repairs.

Although the first cost of a centralized power plant is comparatively high, its advantages over that of a scattered system may be briefly summed up as follows: Cheap grades of fuel may be used under the boilers, and mechanical stokers may be employed and thus reduce the number of firemen required by the several boilers of the scattered plants. The number of engine attendants is also greatly reduced, their places being filled by a few electricians to keep the wiring and motors in working condition. The power may be transmitted to every part of the plant with the smallest amount of loss.

(2) «Receiving Yard,» where the material for each bridge is properly selected, classified and stored.

(3) «Straightening Department,» where the irregularities in the material, due to the shortcomings of the rolling mill processes, are corrected by more accurate methods. The buckles in the plates and the deviations from true alignment in the plates are eradicated by passing them through a series of rolls usually consisting of six sets. These rolls are so arranged that the vertical distance between them can be made less at one end than at the other, so that by passing a plate through them several times, it can be stretched unequally and any imperfections in the alignment of its edges thus corrected. Beams, channels, Z-bars and other odd shapes are best straightened by the application of local pressure to the parts out of line either by screw presses, or by the action of a plunger operated by a power-driven cam. Badly sprung shapes and plates may be straightened by being hammered cold, or after being heated; it is, however, very destructive to the material and dangerous to put into actual use.

(4) «Templet and Pattern Shop,» in which the templets for striking the positions of the rivet and pin holes and the mold patterns for iron and steel castings are made.

A templet is usually a board or framework of boards, one side of which is a representation of one of the sides of the metal shape or piece required to be made. On it the positions for all the rivet holes, pin holes, bevels and notches are accurately marked, and these are subsequently transferred to the metal piece by punching, scratching or other means, preparatory to the final operations of punching, drilling, reaming, beveling, shearing, etc. Templets are usually made of soft white pine boards ⅞ inch in thickness. When very accurate fitting is required, they are laid out full size on the floor of the shop; but, for small and general work, they are made in separate pieces from the detail drawings. As a rule, as many parts as possible of a structure are designed to be in duplicate so that the number of templets required will be as small as possible, and the final fitting and assembling of the work facilitated and simplified.

(5) «Laying-out Shop,» where each individual metal shape, plate and piece is accurately marked in accordance with the templets.

(6) «Punch and Shear Shop,» where the various plates, shapes and pieces are sheared or cut to the required length and bevel, and the holes marked from the templets are punched by suitable machines. See article under title METAL WORKING MACHINERY.

When the thickness of the pieces is greater than the diameter of the punch, punching will unduly strain the material, and the holes will not be straight and smooth. The holes in such plates and shapes are usually drilled, although the process is much slower and more expensive. Single and gang drills are used for this purpose.

Since the punching of a series of holes in a line tends to distort or twist the steel, it is good practice to stagger the holes, also to punch every other hole first, and then the intermediate holes, which permits gang-punching.

Wrought iron and soft and medium steel when of the proper thinness may be easily punched; but hard steel must always be drilled as it cannot be punched without cracking.

Since the diameters of the edges of a punched hole correspond to the diameters of the punch and die respectively, and gives the hole a tapering instead of a cylindrical form, the practice is to require all important holes, and especially those in the tension members, to be reamed to a diameter ⅛ inch larger than that of the punch, so as to remove all of the material injured by the process of punching.

After passing through this shop, all the material is completely ready to be fitted together and riveted to form the final bridge members for which they were designed to form a part. Each piece when completed is marked with a number or letter designating its proper position in the finished member, and all the pieces belonging to the same structure are marked by a job number so that they may be easily identified in the assembling shop.

(7) «The Assembling Shop.» This is usually arranged so that all the heavy work is handled on one side, and the light work on the other. All the different pieces which make up the various members are assembled, fitted and bolted together, and then turned over to the

(8) «Riveting Shop» where the riveting is accomplished by various forms of compressed-air, steam and hydraulic riveters.

When a bridge-member exceeds 10 tons in weight, it is more economical to use portable riveters than stationary riveting machines. As a rule, hydraulic riveters are the most efficient. They do not get out of order easily, and always exert their full pressure upon the rivets; but in their portable form they are very cumbersome, and, therefore, the pneumatic portable riveters are found to be the most convenient in such cases.

Rivets are made of soft steel, and their lengths ought to be such that when put into the holes they will project enough to furnish a sufficient amount of metal to fill the holes completely when they are compressed. Before insertion they are heated to a cherry red, great care being taken, however, not to burn the metal in the heating, and thereby render them hard and brittle. On the other hand, if driven when they are too cold they will not fill the holes completely, and although apparently all right will be weak in the head. All rivet heads ought to be smooth and free from cracks, and concentric with their holes.

(9) «The Machine Shop» is equipped with an endless variety of metal working machines such as planers, boring and turning machines, etc., which are employed to finish the bearing surfaces of the riveted members and other parts which are used in their construction, such as pins, rollers, beds and sole plates, anchor bolts and the various bearing parts of turntables.

The material for the pins and rollers as usually received from the mills has a diameter ⅛ inch greater than that of the finished pins, and has to be turned down to the required size, and the threads cut on the ends for the pin nuts. The planers are employed to smooth off the faces of the bed and sole plates of the expansion joints.

(10) «The Forge Shop» is equipped to turn out three classes of work — the manufacture of rivets, the general smith-work required in a steel structure and the forging of eye-bars.

The soft-steel bars of which the rivets are made are first heated and then passed into the rivet-making machine where they are upset, headed and cut into the required lengths at one operation. The rivets most generally employed in structural work range from ¾ to ⅞ inch in diameter.

The operations designated as general smith-work consist of the bending of plates, shapes and angles in accordance with the requirements of the drawings, the upsetting of the ends of adjustable tension members, the making of clevices and loop eye-rods, and all forgings such as punches, drift-pins and riveting cups that may be needed by the plant.

All the large tension members of pin-connected structures are made in this shop. The steel flats from which these eye-bars are made are handled as follows: About four feet of one end of the bar is heated to a cherry red in the forge and then placed in the upsetting machine which forms a solid head very nearly the size of the finished head. It is then reheated and placed in the die of the steam hammer and hammered out to the proper size and thickness, and a hole punched in the centre of the head to facilitate the finish boring. A careful watch is kept for flaws, and all of those discovered are cut out since they prevent a perfect weld, and are, no matter how small, a source of weakness in the bar. The head on the other end of the bar is formed in a similar manner. A number of bars are then placed in the annealing furnace and brought gradually to a cherry red temperature, after which they are allowed to cool gradually so as to remove local stresses that might have been induced by the processes employed in upsetting and forging the head. The exactitude required in this work is indicated by Cooper's Specifications, 1901, according to which, chord pins are required to fit the pin holes within 1/50 of an inch for pins less than 4½ inches diameter; while for larger pins, the clearance may be 1/32 of an inch. It is also required that the bars must be bored to lengths within 1/64 of an inch for each 25 feet of the total length.

(11) «The Painting and Shipping Department» consists of sheds and yards where the material, after being inspected and stamped, is painted and prepared for shipment.

The facility with which bridge work is carried out depends very much on the character of the drawings supplied. Bridge designers cannot be familiar with the preferred practice in all shops, as these differ; they cannot certainly know what concern is to do the work. It is therefore best not to attempt the smaller details for the first set of designs, and after the work is awarded to a shop allow them to make their own shop drawings in duplicate, adapting them to their own equipment and methods. This is an economy. Those responsible for a bridge, however, require to be careful that the builder does not cheapen construction at the cost of strength. There is a continual temptation to do this, as seen in the lamentable fall of the Quebec Bridge in 1907, where a badly weakened beam passed inspection, and precipitated the fall of the entire structure. Shop designers will know enough to position rivets so as to permit of gang punching. They will avoid beveled cuts and hand riveting, which add to cost; and they will not mark holes for reaming where the strength does not require it. They will avoid the use of side plates, which are always a nuisance; when work is to be left for field riveting they will look out that the rivets may be driven from the top; and in the case of box-shaped columns or the like they will position the angles or channels outward so they may be power-riveted. They will bear in mind that a solid web is stronger, simpler and cheaper than close lacing. Such drop drawings should be carefully marked with all necessary information, as size of rivet holes both before and after reaming, the manner of finishing the edge of webs, etc.

After leaving the shops, and before shipment, the material is carefully examined in detail to see that it conforms in every particular to the drawings and specifications, by the inspectors of both the bridge company and the purchaser. A large percentage of this work is done by inspection companies. These companies employ a large number of inspectors who are sent from one place to another to examine the work on hand. The inspection companies bid for the inspection work at so much per ton of material. Although these companies usually keep a permanent inspector at the works of a large bridge concern, and are therefore able to greatly reduce the cost of inspection to the purchaser, the system is subject to many objections, the principal one being the fact that the actual inspector is personally unknown to the purchaser. The exceedingly satisfactory services rendered by these companies, however are clearly demonstrated by the large amount of work handled by them, and their high professional reputation.

The general method of inspection may be briefly stated as follows: When the inspector of the purchaser arrives at the works of the bridge company, he is furnished with a set of the plans and drawings of the bridges to be inspected, and starts in at once to familiarize himself with the shops and working methods of that particular plant. He then ascertains the rolling mills from which the rough material for the structures will be obtained, and begins the work of actual inspection at that point. All the material is carefully examined for flaws and surface defects, and tested for strength, and when found satisfactory is stamped by him with a hammer, and then forwarded to the works of the bridge company. Subsequently, he keeps a general oversight of the material as it passes through the various shops and departments of the bridge works until it has passed out of them and is ready for the final examination.

BRIDGE, Horatio, American naval officer: b. Augusta, Me., 8 April 1806; d. Athens, Pa., 18 March 1893. He was graduated at Bowdoin College in the famous class of 1825, which included Longfellow, Hawthorne, J. S. C. Abbott and G. B. Cheever. He was admitted to the bar in 1828, and for 10 years was in practice at Skowhegan and Augusta, Me. In 1838 he entered the United States navy as paymaster; made a cruise in the *Cyane* (1838–41); in the *Saratoga* on the coast of Africa (1843–44), some account of which was published in 1845 under the title ‹Journal of an African Cruiser,› edited by his friend, Hawthorne. From 1854–69 he was chief of the bureau of provisions and clothing. In 1873 he was retired as pay-director with the relative rank of commodore. He wrote ‹Personal Recollections of Nathaniel Hawthorne› (1893).

BRIDGE, Sir (John) Frederick, English organist and composer: b. Oldbury, Worcestershire, 5 Dec. 1844. He was successively organist of Trinity Church, Windsor; Manchester Cathedral; and in 1875 became organist of Westminster Abbey. He has also been professor of harmony at Owens College, Manchester, and at the Royal College of Music. Among his works are the oratorio, ‹Mount Moriah›; the cantata, ‹Boadicea›; the cantata, ‹Callirrhoë›; the oratorio, ‹The Repentance of Nineveh,› etc. He has set many hymns to music, notably Gladstone's Latin version of ‹Rock of Ages,› as also such poems as Kipling's ‹The Flag of England› and ‹The Ballad of the Camperdown.› He was knighted in 1897.

BRIDGE OF ALLAN, Scotland, a town in Stirlingshire, on the border of Perthshire, on the banks of the Allan, about three miles north of Stirling, with which it is connected by the Caledonian Railway and a line of tramway cars. The chief buildings are the Hydropathic and Macfarlane Museum of Fine Art and Natural History. The Strathallan Gathering, the most popular athletic meet in Mid-Scotland, is usually held here. Owing to the mildness of its climate and the beauty of its situation, Bridge of Allan is a favorite spring and summer resort for invalids. It is built partly on a plateau of considerable height and partly on low ground on the banks of the river, and is finely laid out with trees and public walks. It is frequented partly on account of its mineral wells. The industries include bleaching, dyeing and paper-making. Airthey Castle, standing in a fine park with a lake, adjoins the town on the south-east. Pop. 3,240.

BRIDGE OF SIGHS, a bridge in Venice, dating back to 1597 built by Antonio Contino. It spans the Rio della Paglia, connects the ducal palace with the prisons, and forms a graceful structure 32 feet above the water, enclosed at the sides and arched overhead. It contains two passages, through which prisoners were led for trial, judgment or punishment. Byron mentions it in the opening lines of ‹Childe Harold› (Canto IV). Thomas Hood has written a poem with this title. It is also used to denote a bridge connecting the Tombs prison, New York, with the court rooms.

BRIDGE-WHIST. See BRIDGE.

BRIDGEPORT, Conn., city, port of entry and county-seat of Fairfield County, on Long Island Sound, and on the New York, New Haven and Hartford Railroad, 54 miles northeast from New York city, 17 miles southwest from New Haven. It is the second city in the State in population. The city and town are coterminous, about 15 square miles in area.

Bridgeport harbor is the estuary of a small river, the Pequonnock, and a tidal inlet, called Yellow Mill Pond, with a peninsula between. The lower part of the harbor is about a mile wide and extends about a mile to the Sound. The two arms of the harbor divide the city into three parts; the main city and chief business centre lies west of the harbor; the section called East Bridgeport with a secondary business street occupies the peninsula; and Summerfield and Newfield sections lie east of the harbor.

Rising from the plain along the Sound are three elevated districts; the nearest, Golden Hill, one of the oldest and finest residential sections, farther back are Old Mill Hill to the northeast and North Bridgeport to the north, both commanding fine views of the Sound. Bridgeport is called «Park City» from its numerous breathing places. The principal parks are Seaside, Beardsley, Washington and Pembroke. Seaside Park contains about 75 acres with a two mile boulevard along the Sound protected by a strong sea-wall. Here are the Soldier's and Sailor's monument and monuments to Elias Howe and Phineas T. Barnum, the sewing machine of the one and the business enterprise of the other having been largely instrumental in the development of the city. Beardsley Park is in the northeastern part of the city and contains about 150 acres, to which river and lakeside, woods and hills give the charm of nature. Washington Park, about four acres, lies in the centre of the east side. Pembroke Park is a long broad green, an expansion of the Old King's highway from New York to Boston. The finest cemetery is Mountain Grove, about 75 acres, near the western boundary. The finest residence sections are Golden Hill, central, Fairfield avenue, the main thoroughfare to the west, Seaside park vicinity in the south, Brooklawn (new) and Clinton avenue in the northwest, Seaview avenue along the Sound in the southeast, and Mill Hill and North Main street with their splendid views. The most notable buildings are the government building, with the post-office and custom house; the Barnum Memorial Institute, bequeathed to the Historical Society and the Scientific Society in common; The Young Men's Christian Association, the Burroughs Library, the Burroughs Home for Women, the Sterling Widows' Home, the Protestant Orphan Asylum and the Bridgeport and Saint Vincent's Hospitals, and a new high school. The public school system has a high school and 25 grammar school buildings. There are about a dozen private and parochial schools. In 1912 the public schools enrolled 15,733 pupils and employed 375 instructors. A free public library established in 1881 now contains about 60,000 volumes. The religious life of the city centres around some 90 churches. The leading denominations are Roman Catholic, Congregational, Protestant Episcopal, Methodist Episcopal, Baptist, Lutheran and Presbyterian. There are many social clubs and secret societies. Chief among the clubs are The Seaside, The Algonquin, The Brooklawn Country Club, The University, The Bridgeport Yacht Club. The oldest Masonic lodge, Saint John's, dates from 1762.

Industries, etc.— Bridgeport is the leading manufacturing city of Connecticut, standing first in the value of products and in the number of employees. It is called the «Industrial Capital.» The manufactured products are in great variety, the diversity is shown by the fact that the Board of Trade has found it literally impossible to make a list of them. New ones are being invented constantly and at least 15,000 articles which may properly be called different have already been counted. Principal among its manufactured articles are cartridges and shells, corsets, sewing machines, heavy ordnance, brass goods, electrical apparatus, silver-plated ware, automobiles, torpedo boats, bicycles, gas and gasoline motors, graphophones, typewriters, machine tools, boilers, cutlery, compressed gas capsules, hats, taps and dies and hardware. Among the largest manufacturing establishments are the Remington Arms and Ammunition Company, whose plant has a combined floor area of 1,104,200 square feet, and employs 16,000 men, Singer Sewing Machine Company (Wheeler & Wilson) with 10 acres of works, Warner Brothers Corset Company, Crane Valve, American Tube and Stamping, Holmes and Edwards Silver-plating, American Graphophone, Union Typewriter Company, Bridgeport Brass Company and the Lake Torpedo Boat Company. The Union Metallic Cartridge Company has an ammunition park of 425 acres here. At the end of 1914 there were in operation 403 establishments capitalized at $81,482,000. These establishments employed 34,586 persons, paid $23,206,000 in salaries and wages and used materials to the value of $44,730,000 which were turned into finished products with a value of $85,123,000. In 1916 the payroll was estimated at $1,200,000 a week, or $62,000,000 for the year. In 1915 new buildings to the value of $9,181,419 were erected, equipped for works of peace as well as for the production of munitions, the demand for which during the European War increased the population of Bridgeport by 50 per cent. The city by its location has excellent transportation facilities. The railroad trackage is ample. A new station has recently been built and the tracks elevated through the city at a cost of over $3,000,000. The harbor admits quite large vessels. There are daily steamers to New York and across the Sound to Port Jefferson, L. I., and much coasting business. The river, creeks and harbor arms are spanned by a half dozen large bridges. Electric railway service is thoroughly developed, continuous lines running to New York and to New Haven, and thence to Boston.

Government and Population.— The government of the city is committed to a mayor, elected every two years, a board of 24 aldermen, 2 from each district, a board of education, 12 members, elected at large 4 members each year, a board of apportionment and taxation, appointed by the mayor. The mayor also appoints members of the police board, board of health, fire commissioners, library board, park commissioners, board of charities, a city engineer and a director of public works. The city's assessed valuation of property is $137,621,212, its debt $1,578,691 and its tax rate about 15 mills per $1,000. The annual outlay is nearly two millions, about a half million being for schools. There are four national banks, five savings banks with deposits of over $30,000,000, two trust companies and a number of private banks. Notwithstanding the proximity of New York the retail business along all lines is extensive. The city has a cosmopolitan population consisting basically of the old New England stock, balanced with the thoroughly Americanized families from Ireland, Germany and Scandinavia. Later additions have been drawn largely from the southern countries of Europe. The growth of population has been as follows: (1810) 1,089; (1820) 1,500; (1830) 2,800; (1840) 3,294; (1850) 7,560; (1860)

13,209; (1870) 18,969; (1880) 27,643; (1890) 48,866; (1900) 70,996; (1910) 102,054; (1914) 115,289; (1920) 143,538.

History.— The first settlement was made in 1639, on lands bought from the Paugusset Indians, who in 1659 were relegated to a reservation on Golden Hill. It was called Pughquannock or Pequonnock, and formed a parish in the towns of Fairfield and Stratford, where the inhabitants went to church till they built their own first one in 1695. In 1694 they petitioned to have it renamed Fairford; the legislature chose Fairfield Village instead; they rejected it and the next year fixed on Stratfield, which, however, was not legalized until 1701. In 1703 the first school building was erected, previous teaching having been in the church on week-days. In 1707 the first services of the Episcopalians were held; in 1748 their first church was built. In 1775 a company from here joined Arnold's expedition to Quebec; and there was much privateering from this place in the Revolution. In 1795 the first newspaper, the *American Telegraph,* was issued. In 1800 the borough of Bridgeport was incorporated, including the village of Newfield, which had grown up at the waterside, the old settlement being along the Boston and New York turnpike, or «Old Stage Road,» now in part North avenue. In 1806, the first bank, Bridgeport Bank, was organized. In 1821 the town of Bridgeport was set off, having then 1,700 inhabitants, 218 dwellings, 73 stores and warehouses, and an assessed valuation of $24,701. On 28 Sept. 1824 the first steamer ran from Derby past Bridgeport to New York; 16 April 1832, the first Bridgeport steamer, the *Citizen,* began regular trips. The Housatonic Railroad was opened to New Milford in February 1840; the New York, New Haven and Hartford began running to Fairfield, 2 Sept. 1848, to New York, 1 Jan. 1849. This ushered in the period of real city development, 1850–60. Gas was introduced December 1861; water, 1854–55; P. T. Barnum bought large tracts of land in East Bridgeport and opened it up after 1850; in 1856 the Wheeler & Wilson Company removed here from Watertown and greatly enlarged their plant; the Howe Company came in 1863, and the Union Metallic Cartridge Company in 1865. In 1870 the city annexed a part of Fairfield; in 1899 Summerfield, and West Stratford across Pembroke Lake. Consult Orcutt's ‹History of Stratford and Bridgeport› (New Haven 1886); Waldo, ‹The Standard's History of Bridgeport› (Bridgeport 1897).

BRIDGEPORT, Ohio, village of Belmont County, opposite Wheeling, W. Va., on the Ohio River, and on the Baltimore and Ohio and the Pennsylvania railroads. It is situated in a coal-mining district and has extensive interests in this commodity. The principal industrial establishments are glass factories, sheet-metal and tin works. The city is governed by a mayor and council. Pop. 3,974.

BRIDGEPORT, Pa., borough of Montgomery County, 17 miles north of Philadelphia, on the Schuylkill River, and on the Philadelphia and Reading Railroad. It is a port of call on the Schuylkill Navigation Company's line. Valley Forge, prominent in the Revolutionary campaign, is six miles distant from Bridgeport. Its industrial establishments comprise cotton, flour, paper and woolen mills, brick works and steel works. Pop. 3,860.

BRIDGEPORT, Texas, city in Wise County, about 11 miles east of the county-seat, Decatur, and 43 miles north of Fort Worth. It is on the Rock Island Railroad; and the principal industries are coal-mining and brick-making. There are two banks whose combined resources amount to $420,000. The public buildings include two high schools and a city hall. The government is in the hands of a mayor and council. Pop. (1920) 1,872.

BRIDGER, James, trader, explorer, scout, and guide: b. Richmond, Va., 1806; d. Washington, Jackson County Mo., 1881. In 1820, at the age of 16 he was already known as a scout and successful hunter, and was soon admitted as a partner in the Rocky Mountain Fur Company, which he furnished with the pelts obtained by himself and a band of men that he led in the pursuit of game through the mountain regions of Montana, the Dakotas, Wyoming, Idaho and the Utahs. A pioneer explorer and discoverer, gifted as a topographical cartographer, «Jim Bridger's lies» became almost proverbial over the descriptions he was the first to give of the geysers and natural wonders of the Yellowstone Park and the Great Salt Lake, until they were verified by subsequent travelers. Fort Bridger on the Black fork of the Green River in Uintah County, Wyo., is the site of the stockade and residence which he built and where he lived with his Shoshone Indian wife for several years. The town of Bridger nearby on the Union Pacific Railroad is also named after him. During 1832–35 he served as guide to the exploring expedition described in Captain Benjamin Bonneville's journal, edited by Washington Irving. In 1862 he was guide to the military escort of the two judges appointed to the territorial supreme court of Utah. In 1868 he acted in an advisory capacity to General Sheridan in his campaign against hostile Indians. Bridger passed the last years of his life chiefly in Missouri. Besides Fort Bridger and the town of Bridger, Wyo., his name is perpetuated in Bridger's Peak of the Gallatin Range, Gallatin County, Mont., 9,000 feet high; and Bridger's Pass, a defile 2,500 feet deep in the Rocky Mountains in southwestern Wyoming. Styled «the Daniel Boone of the Rocky Mountains,» he was a prominent figure for half a century in the early modern history and development of the region. Consult Dodge, Gen. M. Grenville, ‹Life of James Bridger› (1900).

BRIDGER'S PASS, a Rocky Mountain defile in southwestern Wyoming, several miles in length and having a high elevation. Its walls, almost perpendicular, rise from 1,000 to 2,500 feet. Before the opening of the Pacific Railroad it was a feature of the overland stage route.

BRIDGES, Concrete. See CONCRETE BRIDGES.

BRIDGES, Land. See LAND-BRIDGES ACROSS THE OCEAN.

BRIDGES, Lift. Among movable bridges the so-called lift bridges claim a constantly increasing importance, especially in locations where the waterways are narrow, and the population congested. In such circumstances they are in many cases supplanting the existing swing bridges. The chief advantages which lift bridges possess over swinging bridges are: First, they afford a wide channel free from the centre pier and its protective outwork; second, they are more economical of valuable docking space, occupying only their own width, whereas the swing bridge on a narrow waterway requires more than its length; third, they are much more rapid in operation, in many instances passing the river traffic when only partly opened.

The earliest lift bridges were of the hinge type, and were raised by chain or wire cables running from the loose end of the bridge over pulleys at the top of towers at the hinge joint and attached to the compensating weights. To obviate the difficulty of overbalance when the bridge neared the upright position, the weights were made to slide or roll down a curving track which approached more and more the horizontal as the bridge structure approached a vertical position. An interesting variation of this early type was the «jackknife» or folding lift bridge, in which the floor of the bridge was jointed at the middle and the lifting cables attached on the inner side of the joint. The outer end of the bridge was supported by fixed cables. When the bridge was raised the centre was lifted, the outer end folding downward as both halves came to an upright position against the towers.

Modern lift bridges are of two general classes, the bascule or balanced bridges; and the vertical lift or elevator bridges. In the former, the bridge structure is a cantilever with unequal arms, which is swung or rocked through a vertical arc of 90 degrees; in the latter, the movable span is lifted bodily in its normal horizontal position by mechanism acting upon both end simultaneously.

Bascule Bridges.— The bascule bridges follow one of three distinct types: (1) The trunnion type — in which the weight of the bridge together with its counterweight is supported while opening and closing on a trunnion or pivot shaft; (2) the rolling-lift type — in which the counterweight short arm of the cantilever is in the form of a quadrant of a circle, on the circumference of which the bridge is rocked backward and upward; (3) the roller-bearing type — in which the trunnion idea dominates, but the bearing is expanded to a circle of considerable size which rolls in a socket filled with roller bearings. All of these types are represented in single-leaf bridges, of which one shore end is raised; and also in double-leaf bridges in which the two midstream ends of the leaves are raised. In the trunnion and roller-bearing types the centre of rotation is a fixed point, and placed as nearly as possible at the centre of gravity of the moving weight. In the rolling lift type the centre of rotation changes, the centre of gravity moving in a horizontal line backward away from the channel. In the endeavor to overcome the inherent difficulties of the bascule type of bridge a number of different designs have been brought forward by engineers; and as a consequence there are Strauss, Page, Brown, Chicago City and Waddell & Harrington bridges of the trunnion type; Scherzer and Rall bridges of the rolling lift type; and Cowing and Waddell bridges of the roller-bearing type.

Trunnion.— In the Brown bascule bridge, the lifting is done by the old-time method of hoisting cables, which are attached to the span near the hinge joint, and thence guided around an iron form so curved that the pull of the counterweight shall always exactly balance the weight of the bridge.

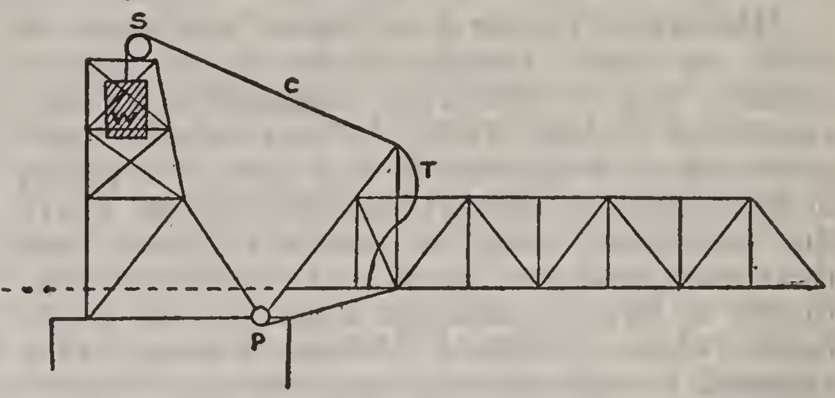

Diagram of Brown Bascule Bridge. P, pivot; C, cable; T, curved track guide for cable; W, counterweight; S, sheave.

In the Strauss bridge the specific peculiarity lies in the fact that the counterweight is not made a part of the short arm of the cantilever, but moves upon a secondary pivot, acting through a parallelogram of links, or struts, which cause the counterweight to move always in parallel with its original position, thus maintaining the leaf in equilibrium at all times.

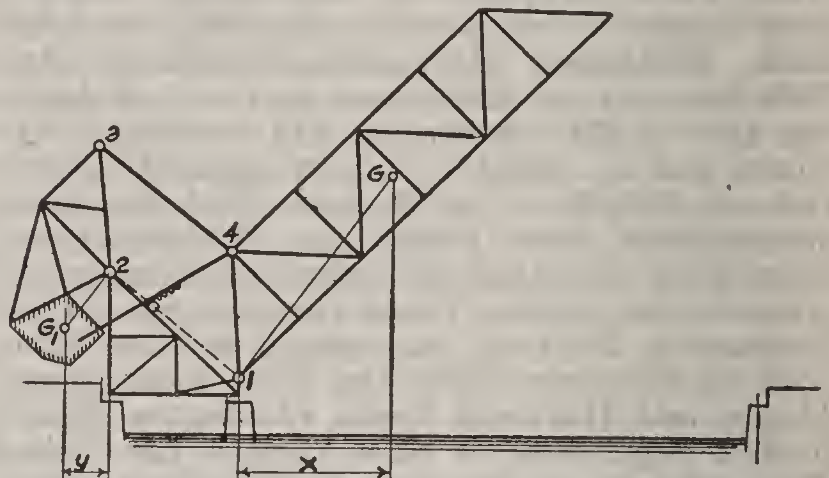

Diagram of Strauss Heel Trunnion Bascule. The figures 1, 2, 3, 4 mark the corners of the characteristic parallelogram of links, the main trunnion being at 1, and the counterweight trunnion at 2. X and Y represent the lever arms respectively of the bridge and the counterweight, G being the centre of gravity of the bridge, and G, of the counterweight.

There are two forms of the Strauss bascule, one with the counterweight below the floor of the bridge in a shallow pit; the other with the counterweight elevated upon a tower — in which case no pit is necessary. A distinct variation of the latter type is the «Heel-trunnion» bascule, in which the counterweight is carried by one end of a trussed frame rocking on the secondary or counterweight trunnion at the top of a stationary tower.

The Page bascule makes use of a movable approach span as a counterweight. This approach span is pivoted at the shore end, and its outer end is weighted, and arranged to travel down a curved track fixed upon the short arm

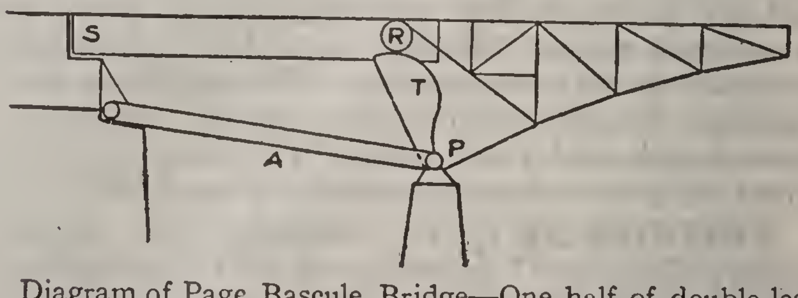

Diagram of Page Bascule Bridge—One half of double-leaf bridge. P, pivot; T, track form down which roller R travels; S, uplifting end of shore span; A, anchoring strut.

of the bascule cantilever. As the leaf lifts, it is accurately counterbalanced by the varying gravity pressure exerted by the weighted shore span upon the curved track member — the curves being calculated to govern the pressure utilized.

In the Chicago City bascule the trunnions supporting the trusses are in the line of the lower chord, and on the shoreward side of the centre of gravity of the moving span. The counterweights are fixed rigidly to the short arm of the cantilever, and as the bridge is opened they sink into a pit.

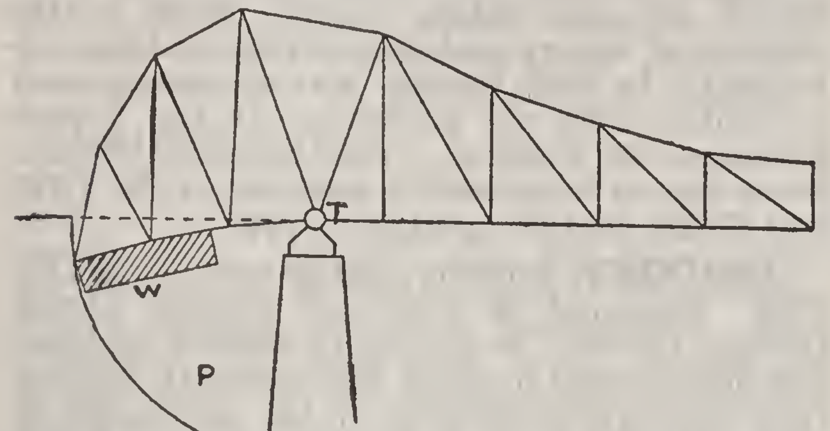

Diagram of Chicago City Bascule Bridge—Ohe half of double-leaf bridge. T, trunnion; W, counterweight; P, pit.

In the Waddell & Harrington bascule the trunnions are high above the roadway, in the line of the upper chord of the truss, and the bearings are on tower-like structures. The counterweight is rigid with the truss and overhead, and is so placed relative to the centre of rotation that the moving span is always in equilibrium. The bridge is swung on its pivots, instead of being rocked, as in the other bascules, and the operating is done with a system of cables instead of with the usual rack and pinion mechanism.

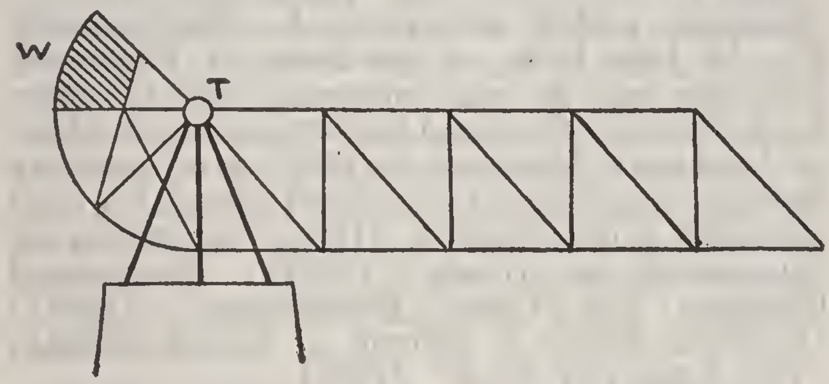

Diagram of Waddell & Harrington Bascule Bridge—One half of double-leaf bridge. T, overhead trunnion; W, counterweight.

Rolling Lift.— It is claimed for the rolling lift type of bascule bridges that besides being more scientific in supporting the weight directly on a foundation instead of on pivots, they are much more economical, saving 12 per cent in length, 24 per cent in the amount of steel used, 45 per cent in the amount of counterweight and over 50 per cent in the weight of the machinery necessary to operate them. The only considerable objection which has been brought against the rolling lift type is that the strains upon the foundation are shifting, being on the channel end when the bridge is closed, and on the shore end when it is open. That this difficulty is overcome in practice is evidenced by the fact that the type is a favorite one with engineers, and that more of the rolling lift bridges are being installed than of all other forms of bascules put together.

In the Scherzer bascule bridge the outer surface of the quadrant-shaped shore end of the bridge has large steel cogs which engage in massive steel racks fixed upon the foundation piers. As the centre of gravity of the bridge is at the centre of the quadrant, the span is perfectly balanced in any position, and requires only power sufficient to rock it on the foundation. The counterweight is generally fixed, either forming a part of the quadrant — in which case no pit is required; or carried on an extension of the shore end of the quadrant — in which case a shallow pit is provided to receive it. In some instances, where the ground will not afford a substantial support for the foundation, it becomes necessary to spread the strains over a large surface, and the counterweight may be suspended from towers, relieving the rack from so much of the weight. This is a common form of bridge for electric railways and in such instances is very cheaply operated by electricity. Larger bridges are operated by steam or hydraulic power. The operating mechanism is of the rack and pinion type and acts upon the top chord of the truss.

In the Rall bascule the trunnions are large and the bridge rolls on them instead of swinging or rocking. When the bridge is closed it rests upon a pivot, which is connected by a swinging strut with a second pivot. As the bridge opens it turns upon the first pivot. The connecting strut comes into play to stop that rotation, the trunnions roll backward upon the track girders, and the channel end of the bridge is pulled upward, the second pivot acting as a fulcrum.

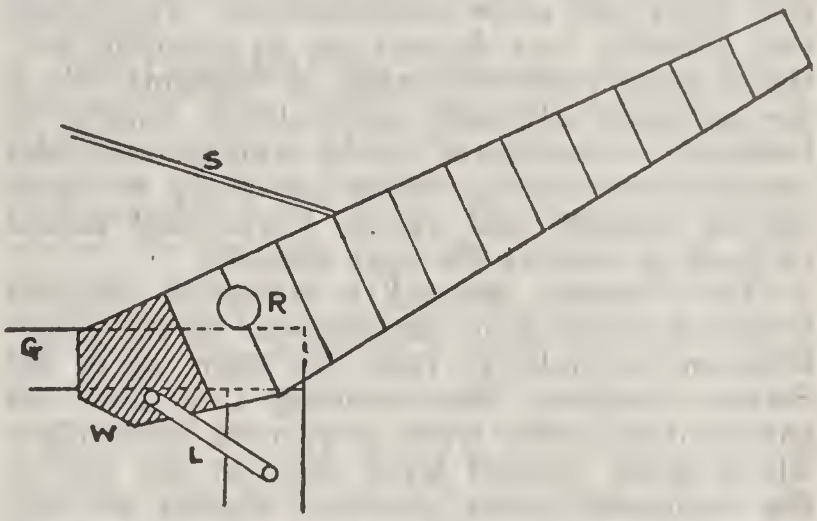

Diagram of Rall Bascule Bridge. G, track girder; R, roller-trunnion: L, coupling link; S, lifting strut; W, counterweight.

Roller Bearing.— The two extant types of the roller-bearing bascules are so nearly alike that charges of infringement of the Waddell patent have been urged against the Cowing patent granted a year later. The general idea is the same — the counterweight member of circular outline, having its centre at the centre

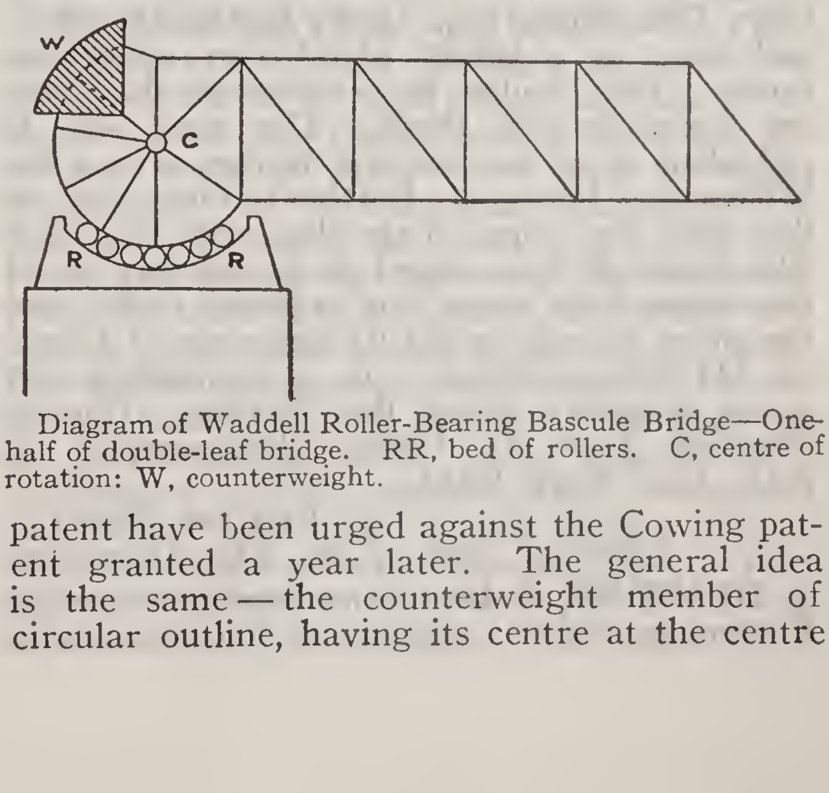

Diagram of Waddell Roller-Bearing Bascule Bridge—One-half of double-leaf bridge. RR, bed of rollers. C, centre of rotation: W, counterweight.

of gravity of the moving leaf, rolls on its circumference through an arc of 90 degrees in a nest of rollers held in a socket-shaped bearing. In the Waddell bridge the structure turns upon seven compound rollers, each made up of a large roller surrounded by 11 small rollers. In the Cowing bridge the structure turns upon 29 solid simple rollers. There is also a difference in the distribution of the counterweight: in the Waddell bridge it is overhead; in the Cowing bridge it is divided, part being below the deck.

Vertical Lift Bridges.— The vertical lift or direct-lift bridges do not exhibit the wide variety in design seen in the bascule bridges. The salient feature of construction in the vertical lift bridge is the skeleton tower at each end of the lift span with its suspended counterweight. In some bridges the tops of these towers are connected across the waterway by trussed girders. The chains or cables which carry the counterweights pass over single or double sheaves at the top of the tower structure. The counterweights balance the lift span when it is closed. As the span is lifted the weight of the suspending chains is added to the counterweight, and as the span approaches the top of the lift it is more and more overbalanced. To obviate this difficulty two devices are in common use: the counterweight is made in sections which are automatically and consecutively caught by brackets on the tower as the weight descends; or counterbalancing chains are hung in loops on the channel side of the tower, and picked up loop by loop as the span ascends.

The Strauss direct-lift bridge is distinct from all others in its employment of the parallelogram of links to raise the span, as in the Strauss bascule, thus avoiding the cables or chains of the other types of vertical lift bridges. These great trussed lever arms at the top of the triangular tower structure display an outline wholly different from all other types.

The relative economy of the vertical lift bridge may best be shown by a few comparative figures. The largest swing bridges are about 500 feet long, and weigh about 3,000 tons. They afford a fairway of about 220 feet on each side of the centre pier. A rolling-lift bascule to give the same clear waterway of 220 feet would weigh about 2,000 tons. A vertical lift bridge affording a free waterway of 220 feet would weigh about 1,500 tons, including its counterweight. One of the largest vertical lift bridges in operation is a double deck bridge across the Missouri River at Kansas City. The lifting span is 413 feet in the clear, and rises to a height of 55 feet above the water. This bridge is peculiar in that only the lower deck is lifted. The same idea is embodied in a vertical lift bridge across the Willamette River at Portland, Ore., but in this case the upper deck also may be lifted. The lower deck is raised to a clearway of 51 feet above high water, for ordinary traffic, and the entire span is raised 93 feet more — a total of 144 feet clearway — to accommodate the ocean steamers using that harbor. Consult Waddell, J. A. L., ‘Bridge Engineering’ (2 vols., New York 1916).

Richard Ferris,
Editorial Staff of the The Americana.

BRIDGES, Robert, American iron-worker. Extremely little is known of him personally. He settled at Lynn, Mass., and in 1643 organized a company to work the deposits of «bog iron-ore» in that vicinity. He went to London, and organized a «Company of Undertakers for the Iron Works,» comprised of wealthy Englishmen, who advanced £1,000 for the work. Foundrymen were brought from England and Scotland, a plant was established on the Saugus River, and for several years furnished most of the iron used in this country, though ultimately the undertaking failed, owing to the scarcity of money and difficulty of making collections. In 1645 Bridges was a commissioner to confer with the governors of the French provinces in Canada. The Colonial records show him to have been a member of the General Court, and its speaker in 1646.

BRIDGES, Robert, English poet: b. 23 Oct. 1844. Educated at Eton and Corpus Christi College, Oxford, he afterward studied medicine and held several hospital appointments, retiring from the active exercise of his profession in 1882. He is one of the most scholarly of modern English poets and has published, usually privately, eight plays and several collections of poems. He succeeded Alfred Austin as Poet Laureate in 1913. Among his works are ‘Prometheus’; ‘Achilles in Scyros’: ‘Eros and Psyche’; ‘Shorter Poems’; Milton's Prosody.’ Selections of his more outstanding verse were published in three volumes, 1898–1900, and his complete poetical works, excluding his plays, appeared in 1913.

BRIDGES, Robert, pseudonym Droch, American author and poet: b. Shippensburg, Pa., 13 July 1858. A graduate of Princeton, for some time he was connected with the New York *Evening Post* and became assistant editor of *Scribner's Magazine* in 1887. His sparkling reviews contributed to *Life* and signed «Droch» attracted wide attention. He is the author of ‘Overheard in Arcady’ (1894); ‘Suppressed Chapters and Other Bookishness’ (1895); ‘Bramble Brae,’ a volume of poems (1902); ‘The Roosevelt Book’ (1904).

BRIDGET, the name of two saints in the Roman Catholic Church.

1. Saint Bridget, or Saint Bride: b. Fochard, Armagh, Ireland, about the beginning of the 6th century. She was exceedingly beautiful, and to avoid the offers of marriage and other temptations to which this worldly advantage exposed her, implored God to render her ugly. The prayer was granted, and, retiring from the world, Bridget built herself a cell under a large oak, hence the name Kill-dara or Kildare, the cell of the oak. Hither she was followed by numerous other virgins, and an order of nuns was established which spread into different countries and flourished for centuries. Saint Bride is one of the chief Irish saints, and was held in great reverence in Scotland.

2. Saint Bridget, Birgit, or Brigitte, daughter of a Swedish prince: b. about 1302; d. Rome 1373. At the age of 16 she married Ulf Gudmarssen, afterward seneschal of Nericia, by whom she had eight children. Her husband and she then made a vow of mutual continence. On her husband's death she founded the convent of Wadstena, in East Gothland, under the rules of Saint Augustine. She made a pilgrimage to Palestine, and died on her return. She

was canonized in 1391. She had left, under the title 'Revelations,' a series of mystic writings, which, after due examination by the proper authorities, were pronounced inspired by Gregory XI and Urban VI. These writings have been translated into Latin and French. The order of Saint Bridget, called also sometimes that of Saint Salvator, or the Holy Saviour, continued in Sweden till the Reformation, and still includes some religious houses in Italy, Portugal and other countries. Her youngest daughter, Catherine, was also canonized and became the patron saint of Sweden.

BRIDGETON, N. J., city, port of entry and county-seat of Cumberland County, at the head of navigation on the Cohansey River, and on the New Jersey C. and the West Jersey & S. railroads, 38 miles south of Philadelphia. It is a very old settlement, having been a place of considerable importance before the Revolutionary War. Its surroundings are agricultural, and it has manufactures of glass, gas-pipe, nails, machinery, flour, oil-cloth, woolen goods, shoes, shirts, clothing, candy, carriages and wagons, boilers and lumber and also large fruit and vegetable canning interests, dyeing and finishing works. It has a public park, Tumbling Dam, which contain a picturesque lake, and a fine field for athletics. The city contains a public library, county and government buildings, two hospitals, insane asylum, the South Jersey Institute, the West Jersey Academy, Ivy Hall Seminary, Seven Gables Seminary, a public high school, two national banks, good water and sewerage systems, and electric lights and street railroads. Its excellent climate and scenic attractions have made the city a popular resort for summer tourists and residents. Bridgeton was made a port of entry in 1790, and incorporated in 1865. It has a modified form of commission government. The municipality owns and operates the waterworks. Pop. 14,209. Consult Nichols, I. T., 'The City of Bridgeton, N. J.' (Philadelphia 1889).

BRIDGETOWN, the capital of the island of Barbados, in the West Indies. It extends along the shore of Carlisle Bay, on the southwest coast of the island, and is nearly two miles long, and about a half mile broad. The town contains a handsome square called Trafalgar Square, in which there is a bronze statue of Lord Nelson, placed there in 1813. The principal buildings include the church of Saint Michael, now the cathedral of the diocese; the church of Saint Mary; the Jewish synagogue; the Central School; Harrison's Free School; a handsome market-place; the barracks at the south extremity of the city; and the military hospitals. The trade in aloes, molasses, sugar and oil amounts to about $5,000,000 annually. Bridgetown is the terminus of Barbados' only railroad. Pop. 16,648.

BRIDGEVILLE, Pa., borough of Allegheny County, on Chartins Creek, near the Washington County line and on the Pittsburgh, Cincinnati, Chicago and Saint Louis, and the Pittsburgh and West Virginia railroads. It has a city hall and a graded school, a trust company, and a national bank with resources amounting to $1.500,000. It has extensive coal interests, glass factories, a steel box factory, iron foundries and a vanadium establishment. The value of the borough's taxable property is $2,000,000. Pop. 3,200.

BRIDGEWATER, Francis Egerton (3d Duke of), British nobleman: b. 1736; d. 8 March 1803. He was the youngest son of Scroop, 4th Earl and 1st Duke of Bridgewater, and succeeded his elder brother, the 2d duke, in 1748. His estate of Worsley contained valuable coal mines, and with the view of establishing communication between these and Manchester, seven miles distant, he conceived the idea of a navigable canal. Having accidentally made the acquaintance of James Brindley, and perceived his great engineering talents, he employed him in the construction of this work, which, after encountering much opposition and ridicule, was at last triumphantly carried through. The canal extends from Worsley to Salford, Lancashire, and is carried over the Mersey and Irwell at Barton by an aqueduct 39 feet above the surface of the water, and 200 yards long. To the execution of this scheme the Duke devoted all his energies and fortune, restricting his expenditure for many years to £400 per annum. He was also a liberal promoter of the Grand Trunk Navigation; and he thus gave the impulse to the extension of the canal system of England.

BRIDGEWATER, Francis Henry Egerton (8th Earl of), English clergyman: b. London, 11 Nov. 1756; d. Paris, 11 Feb. 1829. The son of John Egerton, Bishop of Durham, and grandnephew of the 1st Duke of Bridgewater, he succeeded to the earldom in 1823. He was educated at Oxford, becoming fellow of All Souls College 1780. He was a prince of the Holy Roman Empire; held several preferments in the English Church, but his later years were spent in Paris, where he lived with a family of cats and dogs dressed as men and women, who accompanied him upon his drives. By his will he left $40,000 to be invested in the public funds to be awarded to the author of the best treatise 'On the Power, Wisdom and Goodness of God as Manifested in the Creation.' The selection of the author was left to Davies Gilbert, then president of the Royal Society, who decided to divide the sum among eight persons for as many treatises on various aspects of the theme. The Earl was the author of several scientific, historical and other works, and bequeathed all his manuscripts to the British Museum with $60,000 to keep up and extend the collection. See Bridgewater Treatises.

BRIDGEWATER, or **BRIDGWATER,** England, a municipal borough and port, 33 miles southwest of Bristol in the county of Somerset, on the river Parret. Although the town is about 10 miles from the sea, vessels drawing 19 feet of water can come up to the quay at springtides; but great inconvenience is sometimes caused by the bore. The river divides the town into two parts, which are connected by an elegant iron bridge of one arch. The houses are generally well built, and chiefly of red brick. Among the chief buildings are the parish church (Saint Mary Magdalene's), a handsome ancient structure, with a tower and spire; Saint John's Church and the town hall, a handsome building in the Venetian style. There is a free grammar school, an infirmary and almshouses. A considerable shipping trade is carried on, chiefly coastwise. The imports are timber, grain, coal, tallow, esparto, linseed, etc.; exports, timber, bricks, etc. The chief manufacturing industry is that of bath-bricks which are made here (and indeed nowhere else in great quantities. Bridgewater obtained its name, Burgh-Walter, from its having belonged to Walter de Douay, one of William the Conqueror's followers. In the Civil War the inhabitants embraced the cause of Charles I and defended the town resolutely against the Parliamentarians, but surrendered (1645) to Fairfax. In the castle built by King John, the Duke of Monmouth lodged, and was here proclaimed king in 1685 before the battle of Sedgemoor, which was fought about three miles from the town, and succeeding Bridgewater became the theatre of Feversham's and Jeffreys' barbarities. Up till 1870, when it was disfranchised for bribery, Bridgewater returned two members to Parliament. Pop. 16,802.

BRIDGEWATER, Mass., town in Plymouth County, on the New York, N. H. & H. Railroad, 27 miles south of Boston. It contains five villages and has a State Normal School, the State farm, State almshouse, a public library, a savings bank and manufactures of iron, nails, tacks, boots, shoes and brick. The first settlement was in 1645 as a plantation of Duxbury. In 1656 it became a separate township and discarded its aboriginal name of Nunkatateset. East, West and North Bridgewater (the latter now Brockton), have since been cut from it. Pop. 8,000.

BRIDGEWATER TREATISES, The, works which grew out of a singular contest in compliance with the terms of the will of the last Earl of Bridgewater, who died in 1829. He left $40,000 to be paid to the author of the best treatise 'On the Power, Wisdom and Goodness of God, as Manifested in the Creation.' The judges decided to divide the money among the authors of the eight following treatises whereby each received £1,000 with the copyright of his own treatise. 'The Adaptation of External Nature to the Moral and Intellectual Constitution of Man' by Dr. Thomas Chalmers (1833); 'Chemistry, Meteorology and the Function of Digestion considered with reference to Natural Theology,' by William Prout (1834); 'History, Habits and Instincts of Animals,' by William Kirby (1835); 'Geology and Mineralogy,' by Dean (William) Buckland (1836); 'The Hand... as Evincing Design,' by Sir Charles Bell (1833); 'The Adaptation of External Nature to the Physical Condition of Man,' by John Kidd, M.D. (1833); 'Astronomy and General Physics,' by William Whewell (1833); 'Animal and Vegetable Physiology,' by Peter Mark Roget (1834). All these essays were published as tracts for the London *Times,* and have had a great circulation and influence in the development of liberal thought on important questions governing humankind.

BRIDGMAN, Elijah Coleman, American missionary: b. Massachusetts 1801; d. Shanghai, China, 1861. He was graduated from Amherst College, 1826, and from Andover Theological Seminary, 1829, and immediately joined Dr. Morrison at Canton. He soon attained a wonderful mastery of the Chinese language, becoming in 1839 official interpreter to Imperial Commissioner Lin, and in 1844 interpreter and secretary to the United States Minister, Caleb Cushing. He founded *The Chinese Repository,* a magazine of the greatest value and interest for all subjects relating to the Flowery Kingdom. He compiled a Chinese 'Chrestomathy' in the Canton dialect, a quarto volume of 734 pages, and the first practical manual of that dialect prepared in China. His life has been written by his widow, Mrs. E. J. Bridgman, under the title 'The Pioneer of American Missions in China' (New York 1864).

BRIDGMAN, Frederick Arthur, American genre and historical painter: b. Tuskegee, Ala., 10 Nov. 1847. He studied at the Brooklyn Art School and at the Academy of Design in New York. From 1863–66, he was a steel engraver for the American Bank Note Company. In the latter year he went to Paris where he attended the Ecole des Beaux-Arts and studied under J. L. Gérôme. In 1871 he went to Algiers and travelled extensively in northern Africa, Egypt and Nubia. He then began to paint subjects of Oriental tone, somewhat in the manner of Gérôme, but with more mastery of color. He has long resided in Paris, and has exhibited his works with much success both in Europe and in the United States. He was elected to the National Academy of Design in 1891, and in 1900 was made chairman of the department of American Art in the Paris Exposition. He is an officer of the Legion of Honor (1907) and of the Bavarian Order of Saint Michael, and has received many medals. As a composer of orchestral music, he has written several fine things; a few symphonies; and is author of several works in English and French on art subjects. Among his best paintings are 'An American Circus in Normandy'; 'L'Arabe'; 'Pharo'; 'The Diligence' (Liverpool Gallery); 'The Destruction of Pharaoh's Host' (1892, Academy of Arts, Petrograd); 'Ars Dramatis'; 'Procession in Honor of Isis'; 'The Bocher, Biskra'; and the 'Greek Girl.'

BRIDGMAN, Herbert Lawrence, American journalist and explorer: b. Amherst, Mass., 30 May 1844. Graduating at Amherst College in 1866, he entered journalism and became business manager of the Brooklyn *Standard Union.* In 1894 he accompanied and wrote an account of the Peary auxiliary expedition; in 1897 he was with Professor Libbey of Princeton when the latter scaled the «Enchanted Mesa» of New Mexico; and in 1899 he commanded the Peary auxiliary expedition on the steamship *Diana,* and in 1901 a second Peary auxiliary expedition on the *Erik.* In 1905 he traveled extensively in Egypt and the Sudan and in 1913 in the Balkans. He received the honorary degree of M.A. from Amherst College in 1904; was made chevalier of the Order of Leopold II by the King of Belgium in 1909; is a member of the International Polar Commission; has been chairman of the Publishers' Association of New York since 1911 and was elected president of the American Newspaper Publishers' Association in 1914. Has published 'The Sudan-Africa from Sea to Centre' (1905).

BRIDGMAN, Laura Dewey, American blind deaf-mute: b. Hanover, N. H., 21 Dec.

1829; d. 24 May 1889. She was a bright, intelligent child, but at two years of age her sight, hearing and smell were entirely destroyed by fever. Yet she learned to find her way about the house and neighborhood, and even to sew and to knit a little. In 1839 Dr. Samuel G. Howe, of Boston, undertook her care and education at the Perkins Institution. The first attempt was to give her a knowledge of arbitrary signs, by which she could interchange thoughts with others. Then she learned to read embossed letters by touch; next, embossed words were attached to different articles, and she learned to associate each word with its corresponding object. The next step was to procure her a set of metal types, with the letters cast at the ends, and a board with square holes for their insertion, so that they could be read by the finger. In six months she could write the names of most common objects, and in two years had made great bodily and mental improvement. Her touch grew in accuracy as its power increased; she learned to know people almost instantly by touch alone. In a year or two more she was able to receive lessons in geography, algebra and history. She received and answered letters from all parts of the world, and was always employed, and, therefore, always happy. She learned to write a fair, legible hand, to read with great dexterity, to think and reason well, and at last became a teacher to others afflicted like herself. Consult Lampson, ‹Life and Education of Laura Dewey Bridgman› (Boston 1878); Mrs. Elliott and Hall, ‹Laura Bridgman› (Boston 1903).

BRIDLE, the headstall, bit and reins, by which a horse is governed. It is an instrument of high antiquity. Pliny ascribes the invention of the bridle to Pelethronius, King of the Lapithæ. The first horsemen guided their horses with a rope or stick, and the sound of the voice. A cord drawn through the nose is sometimes used for other animals. The ancient Thessalian coins often represent a horse with a long rein trailing on the ground. The Romans were trained to fight without bridles, as an exercise in the *manège*. On Trajan's Column soldiers are thus represented at full speed. The parts of a modern bridle are the snaffle or bit; the headstall, or leathers from the top of the head to the rings of the bit; the fillet, over the forehead and under the foretop; the throat-band, which buttons under the throat; the reins; the nose-band, buckled under the cheeks; the trench, the cavesan, the martingal and the chaff-halter.

BRIDLINGTON, or **BURLINGTON**, England, town of Yorkshire, incorporated in 1899. It is situated on a beautiful bay, 37 miles northeast from York, on the Hull and S. Railroad, and consisting of one principal and several smaller streets. It is a favorite watering-place, with a fine harbor. The parish church forms part of an ancient priory of elegant architecture, but now much defaced. There are several Dissenting chapels and a free grammar school. A considerable trade is carried on in corn. Pop. about 15,000.

BRIDPORT, England, seaport and municipal borough, in Dorsetshire, lying between the rivers Bride, or Brit, and Asker, in a fertile valley surrounded by hills, 15 miles west from Dorchester and about 1½ miles from the sea. The Bride and Asker unite a little below the town, the united stream being called the Brit, and form a safe and commodious harbor for vessels not over 250 tons. Bridport consists mainly of three spacious streets, containing many well-built modern houses, chiefly of brick. In the centre of the town is the town hall and market-house, a handsome building in the Grecian style. The parish church of Saint Mary's is a beautiful structure, cruciform, with a central tower, and contains a fine organ. At the northern entrance to the town is the more recent and less attractive Saint Andrew's Church. There are, besides, several Dissenting chapels, schools, a library and scientific institute; and extensive manufactures of shoe-thread, ropes, cordage, sail-cloth, fishing-nets, etc. Bridport was a considerable town even before the Norman Conquest, and a parliamentary borough from the reign of Edward I to the passing of the Redistribution Act of 1885, when it was disfranchised. Pop. 5,919.

BRIE, brē, a former county or district of France lying between the Seine and the Marne, and now contained in the departments of Aisne, Marne and Seine-et-Marne. It was divided into Brie Française, Brie Champenoise and Brie Poilleuse. The latter was the largest of the divisions and had for its capital Meaux. Its chief wealth was in vineyards and pastures; and its butter and cheese acquired and still retain a wide celebrity. Brie Française produced grain in great abundance, and was likewise a good grazing country. In ancient times this district was partly covered by a vast forest, portions of which are still to be seen. It was subjugated by the Franks, who annexed it to the kingdom of Neustria. In the 9th century it was ruled by its own counts. One of these, having obtained the earldom of Troyes or Champagne, in 968 united the two countships, which thenceforth shared the same fortunes. Both passed into the possession of the Crown in 1361.

BRIEF (from the Latin *brevis*, short), a brief or short statement or summary, particularly the summary of a client's case which the solicitor draws up for the instruction of counsel. In American practice a brief is an abridged statement of a party's case. It should give the names of the parties to the action, their residence and occupation, and tell the character in which they sue and are sued, and wherefore they prosecute or resist the action. It should contain an abridgment of all the pleadings; a chronological and methodical statement of the facts, in language easily understood; a summary of the questions in issue, and of the evidence which is to support each of the issues; the names of the witnesses by whom the facts are to be proved, or if there be written evidence, an abstract of such evidence; a description of the personal character of the witnesses, whether morally good or bad, whether they are naturally timid or over-zealous, firm or wavering, and the like. It should contain also a summary of the evidence of the opposite party, if known, and such facts as are adapted to oppose, confute or repel it. The object of the brief is to inform the person who tries the case of the facts important for him to know.

In some of the State courts and in the Supreme Court of the United States it is customary or requisite to prepare briefs of cases for the perusal of the court. These are usually printed. Briefs vary according to the purposes for which they are to be used. The points in a brief intended for the court should be printed in a bold, heavy-faced letter, although subordinate matter may be put in capitals, italics and common type, according to its importance. The word has a different meaning in Great Britain, where it is the duty of the attorney to prepare the case only, and that of the barrister to plead the case before court. A brief, under the English practice, is the concise statement of the case as it leaves the hands of the attorney, and serves as a guide to the barrister as well as his instructions for proceeding in open court. A brief intended for the court must be in decorous language and respectful to a judge from whose decision an appeal has been taken, and to the opposite party and counsel and all other persons named therein. Consult Abbot, N., 'Brief Making and the Use of Law Books' (Saint Paul 1906). The phrase «Brief of Title» is sometimes employed in the place of the usual term «Abstract of Title» to denote the concise statement of the deeds, conveyances and changes in ownership which may have occurred in the history of the title to a certain piece of real estate.

BRIEF, Papal (cf. German *Brief,* a letter), a pastoral letter in which the Pope gives his decision on some matter that concerns the party to whom it is addressed. The brief is an official document, but of less public character than the bull. It usually deals with matters comparatively private and subordinate, not, as the bull, with matters affecting the Church at large or an entire nation. It is not signed by the Pope himself, but by an officer called «Il Segretario de' Brevi,» and is sealed on red wax with the Pope's private seal, the fisherman's ring. Briefs are of two kinds: apostolic, those which issue from the Pope himself; and penitentiary, issuing from the office which bears that name. The form of address is «Dilecte Fili» («beloved son»); it is superscribed «Papa» and concludes with the words «Datum Romæ sub annulo piscatoris» («given at Rome under the seal of the fisherman»).

BRIEG, brēg, Germany, town of Prussian Silesia, on the left bank of the Oder and on the railway between Vienna and Breslau, 27 miles southeast of the latter town. Beautiful promenades cover the site of the encircling ramparts destroyed by the French in 1807. The castle residence of the old counts of Brieg is the most interesting of its public buildings. Brieg's cattle fairs are the most important in the province and a thriving trade is carried on in its manufactures of linen, woolens and cottons, tobacco, cigars, starch, etc. Brieg has an interesting history dating from ancient days when it was styled *Civitas Altæ Ripæ.* Pop. 30,000.

BRIEGER, brē'ger, **Johann Friedrich Theodor,** German Protestant historian: b. Greifswald, 4 June 1842. After studies at Erlangen and Tübingen, he became professor of Church history at Marburg in 1873 and at Leipzig in 1886. A specialist in the history of the Reformation period, he is editor of the *Zeitschrift für Kirchengeschichte* and his published works include 'Quellen und Forschungen zur Geschichte der Reformation' (1884); 'Die theologischen Promotionen auf der Universität Leipzig 1428–1539 (1894).

BRIEGLEB, brek'lap, **Hans Karl,** German jurist and historian: b. Bayreuth 1805; d. 1879. In 1842 he became professor of law at Erlangen and in 1845 at Göttingen. Through his researches in the literature of the Middle Ages, he attained celebrity by establishing an historical basis for the theory of civil procedure. His principal work is 'Ueber exekutorische Urkunden und Exekutivprozess' (1839); and he also wrote 'Summatim Cognoscere, Quid et Quale Fuerit apud Romanos' (1843); 'Rechtsfälle zum akademischen Gebrauch' (1848–50); 'Einleitung in die Theorie der summarischen Prozesse' (1859); 'Vermischte Abhandlungen' (1868).

BRIEL, brēl, or **BRIELLE,** brē-ĕl', sometimes The Brill, a fortified seaport town on the north side of the Island of Voorne, near the mouth of the Meuse, in the province of South Holland, Netherlands. It contains a government arsenal and military magazine and possesses a good harbor. The tower of Saint Peter's Church serves as a lighthouse. Saint Catherine's Church contains the tomb of Admiral Philippus van Almonde. Its male inhabitants are chiefly engaged as pilots and fishermen. Briel may be considered as the nucleus of the Dutch republic, having been taken from the Spaniards by William de la Marck in 1572. This event was the first act to open hostility to Philip II and paved the way to the complete liberation of the country from a foreign yoke. The celebrated admirals De Witt and Van Tromp were natives of Briel. Pop. about 4,000.

BRIENNE, brē-ĕn, **John of,** celebrated crusader: b. 1148; d. 1237. He was the son of Erard II, Count of Brienne; was present at the siege of Constantinople in 1204, and afterward, in 1209, married the granddaughter and heiress of Amaury, King of Jerusalem. Brienne thus obtained an empty title, and having been crowned at Tyre in 1210, defended himself, though with a very inferior force, against the attacks of the Saracens. The Emperor Frederick II, having engaged to join the Crusade, provided the sovereignty of the Holy Land were ceded to him, Brienne abdicated in his favor and gave him his eldest daughter, Yolande, in marriage. He afterward, in 1222, married Berengaria, sister of Ferdinand of Castile, as his second wife, and retired from the East; but the state of affairs there again brought him on the stage. He was crowned Emperor of the East in 1231, and continued to defend his dominions against all aggressors, more especially against the united forces of Vataces, Emperor of Nicæa, and Azan, King of Bithynia.

BRIENNE, or **BRIENNE-LE-CHÂTEAU,** lẹ-shạ-tō, or **BRIENNE-NAPOLÉON,** nạ-pō-lē-ôn, a small town of France, department of Aube (Upper Champagne), about 23 miles northeast of Troyes, was the seat of the military academy at which Napoleon received his first instruction in the military art, entering the military school here in 1779, when he was 10 years old, and remaining until 1784. Brienne-le-Château was afterward celebrated as the scene of a portion of the final struggle in 1814, in which the empire was overthrown, Napoleon being here defeated by the allies under Blücher. Consult Jaquot, ‘Notice historique sur Brienne’ (Paris 1832).

BRIENZ, brẹ-ĕnts, Switzerland, town in the canton of Bern, beautifully situated on a narrow ledge at the foot of the Bernese Alps and on the northeast shore of the Lake of Brienz. Its church, built in 1215, together with some old ruins and a handsome school, is finely situated on a height. Brienz is noted for its cheese and as the centre of the Oberland wood-carving industry. The Lake of Brienz, one of the most picturesque in Switzerland, is formed by the river Aar and discharges its water through the valley of Interlaken into Lake Thun, lying 24 feet below it. The lake has daily steamboat service between Brienz and Interlaken, and by this route many tourists visit the famous Giessbach Fall. Pop. 2,518.

BRIER CREEK, a small stream rising in Warren County, Ga., flowing southeast for about 100 miles and entering the Savannah River a few miles east of Jacksonborough. It is noted for a battle during the Revolutionary War. After the American victory on Kettle Creek, in February 1779, General Ashe was sent at the head of about 1,500 troops to drive the British from Augusta. The British, under command of General Campbell, evacuated the city, retreated to Brier Creek and after crossing destroyed the bridge. Ashe pursued them, arrived at the creek 27 February, and there, 3 March, he was surprised by 1,800 British under General Prevost. The American troops were hastily called to arms and as the British advanced opened upon them a heavy fire, but an unfortunate movement in their line gave the enemy an advantage which decided the fortune of the day. The Americans were put to flight, many were drowned in trying to swim the Savannah, or were lost in the swamps. Their total loss was about 200 killed and wounded and as many others were taken prisoners. The British had only 5 killed and 11 wounded. The victory restored Augusta to the British and reinstated temporarily the royal government of Georgia.

BRIERLEY, Benjamin, Lancashire dialect writer: b. Failsworth, near Manchester, 26 June 1825; d. Harpurhey, near Manchester, 18 Jan. 1896. In boyhood a bobbin-winder and in manhood a silk-warper, he was consumed by a passion for reading, and first attracted attention by his articles in the Manchester *Spectator* entitled «A Day's Out» (1857). He took up journalism in 1863, joining the staff of the Oldham *Times,* and from 1869–91 published *Ben Brierley's Journal.* He was one of the founders of the Manchester Literary Club. His works include ‘The Laycocks of Langleyside’ (1864); ‘Ab-o'th 'Yate in London’ (1868); ‘Ab-o'th 'Yate on Men and Things’ (1868); ‘Ab-o'th 'Yate Dictionary’ (1881); ‘Ab-o'th 'Yate Sketches’ (1896): ‘Collected Works’ (1882–86), and ‘Home Memories’ (an autobiography 1886).

BRIERLEY HILL, England, a market-town of Staffordshire, on the Stour, nine miles west of Birmingham. It has several churches, a town hall and a free library. The district abounds in coal, ironstone and clay. The inhabitants are mostly employed in the iron rolling-mills and boiler-works, and in the making of bricks, nails, chains, anchors, spades, glass, pottery, etc. Pop. 12,300.

BRIERRE DE BOISMONT, brē'ĕr de bwäs'moṅ', **Alexandre Jacques François,** French physician and alienist: b. Rouen 1798; d. 1881. After taking his medical degree in 1825, he won in 1831 a gold medal from the Institute for a treatise based on his study of the cholera in Poland. Establishing an asylum for the insane, henceforth his life was devoted to the study and alleviation of mental disease. He wrote ‘La pellagre et la folie pellagreuse’ (1836); ‘La menstruation’ (1842); ‘Le délire aigu’ (1844); ‘Les hallucinations’ (1845); ‘Le suicide’ (1854).

BRIEUX, bré-ė, **Eugène,** French dramatist: b. Paris 1858. He became a journalist and ultimately drifted into play-writing in 1890 with ‘Ménage d'artistes,’ which at once became very popular. Previous to this he had made several more or less unsuccessful efforts in this field. After his first success (at the Théâtre Libre), he became, almost immediately, one of the best known dramatists of France, and he produced play after play, all distinguished by a deep insight into the social problems of the day and keen satirical qualities, and yet he handles tenderly the foibles of mankind and the weaknesses of the characters he meets in the cosmopolitan life of Paris. With his characters, however rough gems they may be, he is ever sympathetic; but his shafts are always keen and sure for hypocrisy, cant and sham. The shams and shortcomings of the educational system of France, the rottenness and temptations of public life, the insincerity and uselessness of fashionable charity and slumming, the doctrine of heredity, the unhappy life of girls of the middle class, owing to the restraints imposed upon them by custom, divorce, gambling and betting, the many injustices worked by the law, the life of the Parisian shop girl, the unfortunate women who become mothers without the law, all form subjects of his dramas and powerful agents for his reform zeal to which he owes his brilliant success rather than to notable qualities as a literary artist. He was elected member of the Academy in 1909. Among his popular plays are ‘Blanchette’ (1892); ‘M. de Réboval’ (1892); ‘L'Engrenage’ (1894); ‘Les Bienfaiteurs’ (1896); ‘L'Evasion’ (1896); ‘Les trois Filles de M. Dupont’ (1897); ‘Le Résultat des Courses’ (1898); ‘Le Berceau’ (1899); ‘La Robe Rouge’ (1900); ‘Les Remplaçantes’ (1901); ‘Les Avariés’ (1901); ‘Petite Amie’ (1902); ‘Maternité’ (1903); ‘Les Hannetons’ (1906); ‘La Francaise’ (1907); ‘Simone’ (1908); ‘Suzette’ (1910); ‘La Foie’ (1912), and ‘La femme seule’ (1912). ‘Les Avariés’ (‘Damaged Goods’) was given in New York in 1913 with great success. See Red Robe, The.

BRIG, a square-rigged vessel with two masts. The term is sometimes used as equivalent to brigantine, but modern American usage makes a difference. See Brigantine.

BRIGADE, in general, an indeterminate number of regiments or squadrons. In the

British army a brigade of infantry is generally composed of three regiments; a brigade of horse, of from 8 to 12 squadrons; and one of artillery, of five guns and a howitzer. A number of brigades form a division and several divisions an army corps. A brigade-major is the chief of the brigade-staff. A brigadier-general commands a brigade. In the United States army three regiments of infantry or cavalry usually constitute a brigade, but there may be two rigiments only, or more than three. The American brigade, like the British, is commanded by a brigadier-general. The brigade combination was introduced by Gustavus Adolphus, whose example was followed by Turenne, who formed brigades of 3,000 to 4,000 men. The use of the term in the French service is somewhat equivocal. In the gendarmerie, as formerly in the cavalry, a brigade is the small fraction of an army under the command of a subaltern officer. In the regular army a brigade now contains two or three regiments of infantry or cavalry or else a mixed body.

BRIGADIER-GENERAL, a military officer of intermediate rank between a major-general and a colonel; the officer in the army of the United States who commands a brigade. In the English and European armies generally the brigade commander is usually a colonel or a lieutenant-colonel, who for a brief period or for some particular service and largely because of his seniority is placed on brigade duty.

BRIGANDINE, a piece of mediæval armor, consisting of thin jointed scales of plate, generally sewed upon linen or leather, the whole forming a coat or tunic. It was lighter than the corselet, more effective than the hauberk and cheaper than either, so that it came into common use. The name came from the brigands, a light-armed irregular soldiery of the 14th and 15th centuries, resembling the Turkish Kurds and Bashi-bazuks, and, like them, addicted to marauding and pilfering: hence the English word «brigand.» It did not come into use until the 15th century.

BRIGANDS, a name first given during the imprisonment of King John in Paris (1358) to the mercenaries who held the city, and whose misbehavior rendered them obnoxious. Froissart applied it to a kind of irregular foot soldiery, from whom it was transferred to simple robbers. It is now used especially of such of these as live in bands in secret mountain or forest retreats. In this sense the pest has been common to most countries by whatever name the robbers may have been known — whether the escaped slaves and gladiators of Rome, the pre-Islamite brigands of Arabia, English outlaws and highwaymen, German robber nobles, the later banditti of Mediterranean countries and of Mexico, American stage-coach robbers, Australian bushrangers or the dacoits and hill robbers of Asia. It has ever flourished under weak or corrupt governments, and patriotism at times has swelled its ranks, always largely recruited from those disposed readily to join in any political movement, and has transformed them into guerrilla companies, who have carried on a bitter warfare against the invader. Such Spanish bands harassed the French during the Peninsular War; in Italy the Austrian troops were frequently engaged in expeditions against the banditti led by the daring Bellino («*Il Passatore*»), and in Greece the Klephts rendered brave and worthy service in the war of independence. In Cuba, in 1888, political discontent was made the excuse for the brigandage then rampant in the island, where four provinces were on this account declared in a state of siege. Religious persecution also has encouraged brigandage; in Bosnia, which has always produced the most perfect specimens of bandits, it was formerly very common, the unhappy Christians, who were reduced by the Turks to the condition of serfs, frequently taking to the mountains in despair, and then wreaking vengeance on their oppressors. Generally speaking, in countries with a notably scanty population, which is yet in many districts as notably overcrowded, brigandage will be found still in existence. Vigorous steps have been taken during the last 50 years to repress the practice, and in some countries with signal success. In Greece, organized companies of brigands, as distinguished from bands of highway robbers, fortuitously collected, have disappeared; and, in Italy, the chiefs with whom princes made treaties are found only in history. Nevertheless, brigandage is by no means obsolete. In Hungary, where it has flourished from time immemorial, and where even the free towns in the 15th century enrolled companies for organized rapine, and thus raised it to the height of an institution, it has found a stronghold in the shades of the Bakony Forest, whose swineherds are said to be in league with the bétyars, and even do an occasional stroke of business on their own account. In Sicily it is to be feared that this is still the only trade which really prospers in the island (see MAFIA); and the bands that infest the Turkish frontier are notoriously dangerous to the wayfaring merchant and the defenseless tourist. In 1887 special attention was attracted by the boldness of brigands in the Pyrenees, Tuscany, Serbia, Macedonia, Asia Minor and Mexico.

BRIGANTES, brĭ-găn'tēz, the name of the most powerful of the old British tribes, inhabiting the country between the Humber and the Roman wall.

BRIGANTINE, a sailing-vessel with two masts, the foremast rigged like a brig's, the mainmast rigged like a schooner's; also called «hermaphrodite brig.» The term is applied to different kinds of vessels by mariners of different countries. The term «brigantine» was formerly applied to a light, flat, open vessel, with 10 or 15 oars on a side, furnished also with sails, and able to carry upward of 100 men. The rowers, being also soldiers, had their muskets lying ready under the benches. Brigantines, being very fast sailers, were frequently made use of, especially in the Mediterranean, for the purpose of piracy, from which fact they derived their name.

BRIGGS, Charles Augustus, American clergyman and author: b. New York, 15 Jan. 1841; d. 8 June 1913. For a number of years he was pastor of the Presbyterian church at Roselle, N. J. In 1874 he was appointed professor of Hebrew in Union Theological Seminary, New York. He was tried for heresy in

1892, and was acquitted. In 1897 he formally severed his connection with the New York Presbytery and became a clergyman of the Protestant Episcopal Church. He was one of the foremost Biblical scholars in the world, and the Episcopal Church in this country might be searched in vain to find his equal as a teacher of Hebrew and the cognate languages and as an authority in that department of learning, or even one who is entitled to be put in the same class with him. Among his works are ‘American Presbyterianism’ (1885); ‘The Bible, the Church and the Reason’ (1892); ‘The Higher Criticism of the Hexateuch’ (1893); ‘The Messiah of the Gospels’ (1894); ‘The Messiah of the Apostles’ (1895); ‘General Introduction to the Study of Holy Scripture’ (1899); ‘The Incarnation of the Lord’ (1902); ‘The Ethical Teaching of Jesus’ (1904); ‘Church Unity’ (1909); ‘Theological Symbolics’ (1914). He was one of the authors of the ‘New Hebrew Lexicon’ (1906).

BRIGGS, Charles Frederick, American author and journalist: b. Nantucket, Mass., 1804; d. Brooklyn, N. Y., 20 June 1877. Throughout his life he was engaged in journalism in New York, and under the pseudonym of «Harry Franco» was widely known. In 1844 he founded the *Broadway Journal,* and for a time Edgar Allen Poe was his associate editor. He was connected with Putnam’s Magazine (1853–56); the New York *Times,* the *Evening Mirror,* the Brooklyn *Union* (1870–74), and the *Independent.* Publications: ‘Harry Franco: a Tale of the Great Panic’ (1837); ‘The Haunted Merchant’ (1843); ‘Working a Passage’ (1844); ‘Trippings of Tom Pepper’ (1847); ‘Seaweeds from the Shores of Nantucket’ (1853); and in collaboration with Augustus Maverick, ‘The Story of the Telegraph and a History of the Great Atlantic Cable’ (1858).

BRIGGS, Frank Obadiah, American legislator: b. Concord, N. H., 12 Aug. 1851; d. 8 May 1913. A graduate from the United States Military Academy in 1872, he resigned from the army in 1877 to accept a position with the Roebling Company of Trenton, N. J., soon becoming its assistant treasurer. He was elected mayor of Trenton, 1899–1902; State treasurer of New Jersey, 1902–07, and United States senator, 1907–13. He was chairman of the Republican State Committee of New Jersey for nine years, 1904–13.

BRIGGS, George Nixon, American politician: b. Adams, Mass., 13 April 1796; d. Pittsfield, Mass., 12 Sept. 1861. He was governor of Massachusetts from 1844 to 1851, and one of the founders in that State of the Republican party. He studied law, was admitted to the bar in 1818, and soon established a reputation as one of the best criminal lawyers in the State. From 1831–43 he was a representative in Congress, serving through one Congress as chairman of the post-office committee. He was subsequently a judge of the Common Pleas (1851–56). During his term as governor extraordinary efforts were made to induce him to pardon Professor Webster, the murderer of Dr. Parkman, but he refused to interpose. For 16 years he was a trustee of Williams College, and at all times a noted advocate of temperance. His death was the result of an accident received from a gun. Consult Richards, W. C., ‘Great in Goodness’ (Boston 1866).

BRIGGS, Henry, English mathematician: b. Warley Wood, Yorkshire, 1561: d. Oxford, 26 Jan. 1631. He entered Saint John’s College, Cambridge, and distinguished himself by his acquirements in mathematics. In 1596 he was appointed first lecturer on geometry in the newly erected establishment of Gresham House or College, London, and in 1619 became in like manner first Savilian professor of geometry at Oxford, which he resigned in 1620. In 1616 he went to see Napier in Scotland, who had originated the general idea of logarithms. He devoted many years to the study of logarithms, his system being still known as «Briggs’ Logarithms.» Briggs’ great works are his ‘Logarithmorum Chilias Prima’ (1617); ‘Lucubrationes et Annotationes in Opera Posthuma J. Neperi’ (1619); ‘Arithmetica Logarithmica’ (1624); ‘Trigonometria Britannica’ (1633).

BRIGGS, Le Baron Russell, American educator: b. Salem, Mass., 11 Dec. 1855. He was graduated from Harvard University in 1875, was assistant professor of English there, 1885–90, and professor from 1890. He was dean of the university 1891–1902, and is dean of the faculty of arts and sciences since 1902, and Boylston professor of rhetoric and oratory since 1904. He has also been president of Radcliffe College since 1903. He has written ‘Old Fashioned Views of Modern Education’; ‘Original Charades’; ‘School, College and Character.’

BRIGGS, Lyman James, American scientist: b. Assyria, Mich., 7 May 1874. After study at Michigan Agricultural College, the University of Michigan and Johns Hopkins, he was given charge of the physical laboratory, Division of Soils, in the United States Department of Agriculture in 1896, and became physicist in charge of the physical laboratory of the Bureau of Plant Industry. He is the author of ‘The Mechanics of Soil Moisture’ (1897); ‘The Centrifugal Method of Soil Analysis’ (1904); ‘The Moisture Equivalent of Soils’ (1907); ‘Dry Farming in Relation to Rainfall and Evaporation’ (1910); The Wilting Coefficient for Different Plants and its Indirect Determination’ (1912), published as *Bulletins* of the Department of Agriculture.

BRIGGS, William, Canadian clergyman and publisher: b. Banbridge, county Down, Ireland, 9 Sept. 1836. He was educated at Liverpool and, emigrating to Canada while a young man, was ordained to the Methodist ministry in 1863. After successful pastorates in various charges, he held the secretaryship to the conference in 1876–77, and was its president in 1885. He was first elected book steward of the Methodist Book and Publishing House in 1879, and thus became the head of the pioneer book publishing house in Toronto, now the largest in the Dominion.

BRIGHAM, brĭg′ăm, **Albert Perry,** American geologist and author: b. Perry, N. Y., 12 June 1855. He studied at Colgate College, Hamilton Theological Seminary and Harvard University; was ordained Baptist minister; became pastor at Stillwater, N. Y. (1882–85), and Utica (1885–91); was appointed professor of geology at Colgate in 1892; for several sessions instructed in the Harvard Summer School of geology; was professor in the Cornell Summer School 1901–04; professor at the University of Wisconsin 1906; was appointed lecturer in the School of Geography, Oxford University, 1908; and examiner in New York State Education Department 1911–13. He edited the *Bulletin of the American Geographical Society,* and among his published works are ‹A Text-Book of Geology› (1900); ‹Geographic Influences in American History› (1903); ‹Student's Laboratory Manual of Physical Geography› (1904); ‹From Trail to Railway through the Appalachians› (1907); ‹Commercial Geography› (1911).

BRIGHAM, Amariah, American physician; b. New Marlborough, Mass., 26 Dec. 1798; d. Utica, N. Y., 8 Sept. 1849. He began practice at Enfield, Mass., about 1821, but soon removed to Greenfield, where he became widely known for his skill as a surgeon. In 1828 he went to Europe and spent a year studying in the hospitals. In 1831 he settled in Hartford, Conn., and in 1840 was appointed superintendent of the retreat for the insane there. Two years later he accepted a similar position at the State Lunatic Asylum, Utica, N. Y., where he remained till his death. He was a skilful business man, an able physician, and was frequently called to act as an expert in the courts. Publications: ‹Treatise on Epidemic Cholera› (1832); ‹Influence of Mental Cultivation on the Health› (1833); ‹Influence of Religion upon the Health and Physical Welfare of Mankind› (1835); ‹Inquiry Concerning the Diseases and Functions of the Brain, the Spinal Cord, and Nerves› (1840); ‹The Asylum Souvenir› (1849); ‹Mental Exertion in Relation to Health› (1866). Consult Goodrich, C. E., ‹Sermon on the Death of Amariah Brigham› (1850).

BRIGHAM, Sarah Jeannette (Lathbury), American illustrator and writer for young people: b. Manchester, N. Y., 5 March 1835. She was for many years a contributor to juvenile publications, and as artist has illustrated in color. She was married to J. R. Brigham in 1854. She has written ‹Under Blue Skies› (1886); ‹Leopold and His Wheel› (1896); ‹In Daisy Time› (1896); ‹The Pleasant Land of Play› (1898); ‹Twinklenose and Yellow Feather›; ‹Little Brer Rabbit.›

BRIGHAM, William Tufts, American ethnologist: b. Boston, Mass., 24 May 1841, was graduated from Harvard 1862, and admitted to the Massachusetts bar in 1867, was for a year botanical instructor at Harvard and served for six years on the Boston school board. He removed to Honolulu in 1888, and has since been in charge of the Bishop Museum of Ethnology and Natural History there. He has been sent around the world to study museums and their methods, the results published by the *Museum Press,* fully illustrated. He is an honorary member of the Royal Anthropological Institute of Great Britain and Ireland; correspondent of the Berlin and Hamburg Anthropological Societies, and of the Italian Anthropological Society, also of the Imperial Academy of Sciences, Petrograd, and of the Philadelphia Academy of Natural Sciences. In 1905 Columbia University conferred upon him the degree of honorary Sc.D. He has made the museum of which he is director respected throughout the scientific world. He has published ‹Cast Catalogue of Antique Sculpture›; ‹Guatemala, the Land of the Quetzal›; ‹Volcanic Manifestations in New England›; ‹Hawaiian Feather Work›; ‹Index to the Islands of the Pacific›; ‹Ancient Hawaiian Stone Implements›; ‹Hawaiian Mat and Basket Weaving›; ‹Old Hawaiian Carvings›; ‹The Ancient Hawaiian House›; ‹The Volcanoes of Kilauea and Mauna Loa›; ‹Ka Hana Kapa: The Making of Bark Cloth in Hawaii› (1896–1912).

BRIGHAM, Utah, city and county-seat of Box Elder County, 20 miles north of Ogden, on the Oregon Short Line and the Southern Pacific railroads. It has a public library, fruit-canning and cement factories, lumber yards and planing mills. The city has a large fruit trade, especially in peaches. It owns the electric-lighting plant and the waterworks. **Pop.** (1920) 5,282.

BRIGHAM YOUNG UNIVERSITY, Provo, Utah, a coeducational institution founded by Brigham Young in 1875, and by a deed of trust administered by the Latter Day Saints. It has high school, normal and collegiate departments, library, a faculty of 38 members, and an average enrolment of students in recent years of approximately 900.

BRIGHT, Charles, English civil engineer: b. London, 25 Dec. 1863. He is the youngest son of Sir Charles Tilston Bright, who laid the first Atlantic cable, and has been himself employed in cable-laying expeditions in many parts of the world, as well as on various surveying expeditions. He has published ‹The Story of the Atlantic Cable›; ‹The Life of Sir Charles Bright›; ‹Imperial Free Trade›; ‹Imperial Telegraphy›; ‹Engineering Wonders of the World› (joint author); ‹Telegraphy and War.›

BRIGHT, Sir **Charles Tilston**, English telegraphic engineer: b. Wanstead 1832; d. 1888. He was the first to establish telegraphic cable communication between America and Europe, succeeding, 5 Aug. 1858, after two failures, in laying the 2.030 miles of cable which connect Ireland and Newfoundland. He was coinventor with Latimer Clark of the asphalt composition coating for submarine cables and superintended the laying of submarine cables in different parts of the world. He was Liberal member of Parliament for Greenwich 1865 to 1868 and president of the Institute of Electrical Engineers 1886–87.

BRIGHT, James Franck, English historical writer: b. London, 29 May 1832. He was educated at Rugby and University College, Oxford, and was master at Marlborough College for 16 years. He was master of University College, Oxford, 1881–1906. He has written ‹History of England to 1880›; ‹Joseph II› (1897); ‹Maria Theresa› (1897).

BRIGHT, Jesse D., American politician: b: Norwich, N. Y., 18 Dec. 1812; d. Baltimore, Md., 20 May 1875. He received an academic education, was admitted to the Indiana bar (1831), and became a circuit judge, State senator and lieutenant-governor. From 1845 to 1857 he was a United States senator and president of the Senate during several sessions. Re-elected in 1857, he was expelled for alleged disloyalty, 5 Feb. 1862, the chief evidence against him being a letter addressed to «His Excellency, Jefferson Davis, President of the Confederation of States,» recommending a friend who had an improvement in firearms to dispose of. Bright maintained that at the date of the letter (March 1861) he had no idea that there would be war, and wrote it to get rid of the inventor. Subsequently, he settled in Kentucky, and in 1866 was elected to the State senate.

BRIGHT, John, English statesman and orator: b. Greenbank, Rochdale, Lancashire, 16 Nov. 1811; d. 27 March 1889. His father, Jacob Bright, who belonged to a Quaker family originally connected with Wiltshire, migrated to Rochdale early in the century, and there established himself as a cotton-spinner and manufacturer. John Bright, who was the second of 10 children, was educated at Rochdale, Ackworth, York, and finally at Newton, near Clitheroe. At the age of 15 he entered the cotton-spinning business of his father, where, even at that early age, he showed much shrewdness and practical energy. Not satisfied, however, with merely mercantile affairs, he took an enthusiastic interest in such public questions as the abolition of slavery and the Reform Bill of 1831–32, while he diligently educated himself in public speaking at the debates of the Rochdale Literary and Philosophical Society. In 1835 he traveled in Greece,. Egypt and Palestine, and gave an account of the journey in a series of lectures delivered in his native town; but his career as a notable public speaker began with the free-trade movement. To relieve the pressure upon the working population of England occasioned by commercial depression and a bad harvest, it was proposed to cheapen bread by the repeal of the corn duty, and in an association formed for this purpose at Manchester in 1838 Mr. Bright was made a member of committee. In the following year this association, at a meeting in London, was widened into the famous Anti-Corn Law League, in which Richard Cobden and John Bright were the two most prominent members. Yet it was not until after the death of his first wife, in 1841, that, on the personal appeal of his friend Cobden, the former put all his strength into the repeal campaign. In the autumn and winter of that year he organized branches of the league and addressed meetings in nearly all the large towns of England. It was inevitable that such a prominent politician should find a place in Parliament, and in 1843, he was elected as member for the city of Durham. He made his maiden speech in August of the same year on a motion in favor of carrying out the recommendations of the Import Duties Commission of 1840. Thereafter he seized every opportunity to press this question of repeal. The opposition from both of the great parties in the House was dogged, and the controversy might have been prolonged but for the widespread sympathy occasioned by the Irish famine. In January 1846 Parliament was summoned, and Sir Robert Peel announced that his government was prepared to reduce and almost abolish the corn duties. This resolution was carried; but on the question of Irish coercion the government was defeated, and at the general election which followed (1847), John Bright was elected for Manchester. The corn duty question having been satisfactorily settled, he now turned his attention to such subjects as a reform in the affairs of Ireland and India, extension of the suffrage, voting by ballot, and the establishment of a national system of education. At the dissolution of Parliament in 1852 he was re-elected for Manchester, but through his strenuous denunciation of the Crimean War (1854), and his equally decided disapproval of the Chinese War (1856), he was rejected by his constituency at the general election of 1857. This result was made known to him at Florence, where he had retired to recruit after a serious illness, but the disappointment which it caused him was mitigated in a few months by his election for Birmingham, and in 1858 he returned to public life after an absence of two years. During the American Civil War he sturdily advocated the abolition of slavery and gave his passionate adherence to the cause of the North, although as a Lancashire cotton-spinner his business suffered severely from a continuance of the struggle. About this time also his name became closely identified with electoral reform and he had the satisfaction of seeing the principles for which he had contended embodied in the Reform Bill (1867) passed by Mr. Disraeli. He had no desire for office, but his prestige in the Liberal party was so great that it was desirable to include him in the cabinet, and he was constrained to accept the presidency of the Board of Trade in Mr. Gladstone's government (1868). In this office he gave powerful assistance in passing the act for the disestablishment of the Irish Church, the Irish Land Act and the Elementary Education Act. Owing to ill-health he retired from office in 1870, but re-entered the ministry as chancellor of the duchy of Lancaster in 1873. When the Liberal party returned to power in 1880 he again accepted this office; but two years later he resigned as he was opposed to armed intervention in Egypt. At this time and for some years previously he had not appeared often upon public platforms, but in 1883 he delivered a notable address when installed as lord rector of Glasgow University, and another in Birmingham in the same year when celebrating the 25th anniversary of his connection with that city. In 1886 he opposed the Home Rule Bill introduced by Mr. Gladstone, and until his death he strongly identified himself with the Unionist party in its efforts to defeat the Home Rule policy. This opposition was weighted with the same characteristics which had secured for him in previous controversies the respect of the country — a transparent sincerity of purpose which found its fearless exposition by pen and speech in direct, racy, idiomatic English. As an orator his platform manner was remarkable for its ease and unstudied simplicity; the richness and lucidity of his diction, abounding in happy epithets, often edged with irony or glancing with humor; a spirit of outspoken truthfulness breathing through all his utterances; while he was possessed of a voice which laid a spell upon his audience by its clear, round, sonorous fullness. Perhaps the most splendid expression of his sympathetic nature is found in the speeches in which he pleaded for justice to the oppressed populations whether in Ireland or India, while the same broad humanity, even more than the doctrines which were his Quaker birthright. animated his denunciations of war. He opposed the factory legislation with which the name of Lord Shaftesbury is identified and viewed with disfavor the restriction of hours of labor, especially of adults. He was a member of the Society of Friends, and was married first to a Miss Priestman, who died in 1841, and again to a Miss Leatham, who died suddenly in 1878. His life and speeches in two volumes were published in 1881 by G. Barnett Smith, and his public letters by H. J. Leech in 1885. Consult also Robertson, ‹Life and Times of John Bright› (London 1902) and Trevelyan's biography (London 1913).

BRIGHT, Richard, English physician: b. Bristol, 28 Sept. 1789; d. 16 Dec. 1858. He studied at Edinburgh, Berlin and Vienna, and after 1820 was connected with Guy's Hospital, England. His name is associated with Bright's disease (q.v.), he being the first who investigated its character. He published ‹Original Researches into the Pathology of Diseases of the Kidney› (1827); and a book of ‹Travels through Lower Hungary› (1818), which contains a valuable account of the gypsies.

BRIGHT, William, English Church historian: b. Doncaster, 14 Dec. 1824; d. 6 March 1901. He graduated at University College, Oxford, in 1846, and was ordained to the Anglican priesthood in 1850. He was theological tutor at Trinity College, Glenalmond, 1851–58, and in 1868 became Regius professor of ecclesiastical history at Oxford and canon of Christ Church. His chief historical works are ‹History of the Church, A.D. 315–451› (1860); ‹Early English Church History› (1878); ‹Lessons from the Lives of Three Great Fathers› (1890); ‹Waymarks of Church History› (1894); ‹The Roman See in the Early Church› (1896); ‹The Age of the Fathers› (posthumously 1903). He takes high rank as a hymnwriter, the noble communion hymn ‹And now, O Father, mindful of the love,› and the evening hymn, ‹And now the wants are told,› being characteristic examples of his devotional spirit.

BRIGHT EYES (Susette La Flesche), Omaha Indian writer and lecturer: b. Nebraska, 1850; d. Lincoln, Neb., 1902. She was the eldest child of Eshtamaza or Joseph La Flesche, a former head-chief of the Omaha Indians. She attended the Presbyterian mission school on the Omaha reservation, and through the interest of a teacher was sent to a private school in Elizabeth, N. J., where she made rapid progress in her studies. She afterward taught with great success among the young members of the tribe in a government day school on the Omaha reservation. In 1877–78 the Ponca were forcibly removed from their home on Niobrara River, South Dakota, to Indian Territory, where Susette soon afterward accompanied her father when he went to help his sick and dying relatives among the Ponca. The heroic return of Standing Bear, the Ponca chief, and his band, 600 miles to their northern home amid incredible sufferings, the imprisonment and release of Standing Bear. led to public investigations of Indian removals. Accompanied by Susette La Flesche and her brother, Standing Bear visited the principal cities of the United States under the direction of Mr. T. H. Tibbles, to tell the story of the Ponca removal. Under the name of «Bright Eyes» Susette commenced her public work. Her clear description of the injustice of the case, her eloquent appeals for humanity toward her race, her grace, well-bred diction and dignity of bearing aroused the interest of the thousands who listened to her, with the result that the government was petitioned to make no more removals of tribes, and wherever practicable this request was respected. In 1881 Bright Eyes became the wife of Mr. T. H. Tibbles, and later with her husband visited England and Scotland on a lecturing tour. She lived in Lincoln, Neb., an active publicist in the interests of her race until her death.

BRIGHTLY, Frederick Charles, American lawyer: b. Bungay, England, 26 Aug. 1812; d. Germantown, Pa., 24 Jan. 1888. He came to the United States in 1831, and was admitted to the Philadelphia bar (1839). In 1870 he retired to devote himself to legal writing and compilation, for which he had pre-eminent gifts. His private law library of 5,000 volumes was one of the best collections in America. Publications: ‹Law of Costs in Pennsylvania› (1847); ‹Reports of Cases Decided by the Judges of the Supreme Court of Pennsylvania› (1851); ‹Equitable Jurisdiction of the Courts of Pennsylvania› (1855); ‹Analytical Digest of the Laws of the United States, 1789–1869› (1865–69); ‹Digest of the Decisions of the Federal Courts› (1868–73); ‹Bankrupt Law of the United States› (1871); ‹Leading Cases on the Law of Elections› (1871); ‹Digest of the Laws of Pennsylvania, 1700–1883› (1883); and other works.

BRIGHTON (formerly BRIGHTHELMSTONE), England, maritime town and favorite watering-place in the county of Sussex 50½ miles south of London. It is situated on a gentle slope, and is a clean and well-built town, with handsome streets, terraces, squares, etc., and a massive sea-wall, with a promenade and drive over three miles in length, one of the finest in Europe. The buildings of note are not numerous. The only ancient church is that of Saint Nicholas. Holy Trinity Church is memorable for the incumbency of F. W. Robertson, the celebrated preacher. The most remarkable is the Pavilion, built by George IV (then Prince of Wales), between 1787 and 1825. It cost upward of $5,000,000. It is a building in the Oriental style of architecture, with a handsome stone front 300 feet in length, and a large Oriental dome 84 feet high in the centre. To George IV is due the rise of Brighton as a fashionable resort. The Pavilion was discontinued as a royal residence by Queen Victoria in 1841, and was purchased from the Crown by the town of Brighton in 1850 for $260,000. The aquarium is world-famous, and Dyke Road Museum contains a remarkably fine ornithological collection. Owing to the salubrity of its climate, it is a great centre for boarding schools, and its popularity with Londoners is such that it is frequently called London-super-mare. The town received its charter of incorporation in 1854; water, electric light, street cars and race course are municipally owned; and it returns two members to the House of Commons. A fishing village up till 1780, Brighton has a population of 131,237.

BRIGHT'S DISEASE. See KIDNEYS.

BRIGITTINES, or **ORDER OF OUR SAVIOUR,** a branch of the Augustinians, founded about the year 1344 by Saint Bridget of Sweden, and approved by Urban V in 1370. The first monastery, which was also the mother house of the order, was on the founder's estate at Vadstena, on the eastern bank of Lake Vettern, southwest of Stockholm. Some were maintained in Germany, Flanders and others countries; most of them, including the parent house, were destroyed at the Reformation. There are two rich convents of Brigittines at Genoa, into one of which only ladies of high family are admitted. The only house of the order in England was the rich institution known as Sion House, founded by Henry V on the Thames, 10 miles from London. It was one of the first suppressed by Henry VIII. In 1861, some of their successors returned and established themselves at Spetisbury, Dorsetshire. Later on they moved to their present site, Chudleigh, near Exeter. Only four convents of the original order are now found — one in Bavaria, at Altomünster, two in Holland and the one mentioned in England. All the houses of the order are subject to the bishop of the diocese, and no new one can be founded without express permission of the Pope. For the history of the order in Sweden consult 'Scriptores Rerum Svècicarum Medii Avenü' (Vol. I, Stockholm 1871); also 'History of the English Brigittine Nuns' (Plymouth 1886); Steele, 'Story of the Bridgettines' (New York 1911).

BRIL, the name of two Dutch painters (brothers), who distinguished themselves as landscape artists. (1) Mattys, b. Antwerp, 1550; d. 1584. When a very young man he went to Rome, and was so much esteemed by Gregory III that he was employed on the galleries and salons of the Vatican. (2) Paulus, b. about 1556; d. about 1626. He was much superior to Mattys, and hearing of his success at Rome joined him there. The two brothers appear for some time to have worked together on the same pieces; but after Mattys' early death Paulus was employed by Sixtus V, and executed six large paintings in his summer palace. The poetic charm of his work may be seen as a setting to some figure paintings by Annibale Carracci and Rubens. He was also employed by Clement VIII. His works in oil and fresco may be seen in many of the Roman churches. He did many frescoes in the Vatican, the Lateran, the Scala Santa and Santa Maggiore. Of his panel paintings, the best are in Florence, Brunswick, Montpellier, Munich, Paris, Parma and Vienna. Consult Roose, 'Geschiedenis der antwerpsche Schilderschool' (Antwerp 1887–90); Eisler, in London, *Burlington Magazine* (1905); Mayor, 'Das Leben und die Werke der Brüder Mattheus und Paul Brill' (Leipzig 1910).

BRILL, Abraham Arden, American physician and writer upon psycho-analysis: b. Austria, 1874. He came to America while a small boy, and received the degree of Ph.B. at New York University in 1901, and that of M.D. at Columbia in 1903. He was an assistant in the clinic of psychiatry in Zurich, Switzerland, and is at the present the head of the clinic of psychiatry at Columbia University, New York. Brill is considered the leading exponent in America of Freud and Freud's theory of the interpretation of dreams. Besides being a lecturer and writer on psycho-analysis, he is also the English translator of Freud's writings. Brill has written many treatises, and his book, 'Psychoanalysis, Its Theories and Application' (1909), is the standard American work upon the subject. He has also translated Freud's 'Selected Papers on Hysteria' (1910); 'Three Contributions to the Sexual Theory' (1910); 'Interpretation of Dreams' (1913); 'Psychopathology of Every-day Life' (1914).

BRILLAT-SAVARIN, brē'yä' så'vå'rän, **Anthèlme,** French gastronomic author and judge: b. Bellay, 1 April 1755; d. Paris, 2 Feb. 1826. He is famous for his 'Physiologie du goût' (Paris 1825; English translation, 'Gastronomy as a Fine Art,' London and New York 1877), a work distinguished as the finest literary analysis of the art of eating and drinking, abounding with wise comment relieved by sparkling wit and humorous anecdote. He was deputy to the States-General in 1789; judge of the Court of Cassation in 1792; mayor of Bellay in 1793 when to escape the Revolution he fled to New York and earned a living as tutor of French and music and as member of a theatre orchestra. He returned to Paris in 1796 and until his death was a judge of the Court of Cassation. He was also a miscellaneous writer on archæology, political and social economy. See PHYSIOLOGY OF TASTE, THE.

BRILLIANT. See DIAMOND.

BRILLIANT SECOND, a phrase used by the German Emperor William II in a telegram addressed to Count Goluchowski, the Austrian Foreign Minister, after the close of the Algeciras Conference. It was published in Vienna on 13 April 1906. Referring to Austria's support at that conference, the Kaiser wrote — «You have proved yourself to be a brilliant second on the duelling ground, and you may be certain of similar service in similar case from me also.» The message was not favorably received in Austria, and caused especial annoyance in Italy, the third party to the Triple Alliance (q.v.).

BRIMSTONE. See SULPHUR.

BRINDABAN, brĭn-dạ-bŭn', or **BINDABAN,** India, town in the United Provinces, in the district of Muttra, and 35 miles north-northwest of Agra, near the right bank of the Jumna. It is famous as the scene of the youthful sports of Krishna. Brindaban is one of the sacred Hindu cities and is dependent for its prosperity on pilgrims; it is surrounded by sacred groves of trees, has 1,000 temples and has benefited by the munificence of wealthy Hindus, who have built costly shrines. Among these is a cruciform pagoda, with vaulted roof, which is one of the most massy and elaborate of Brahmanical buildings. The American Methodist Church has a mission here. Pop. 30,000.

BRINDISI, brin'dē-sē (ancient BRUNDUSIUM), a seaport and fortified town in the province of Leece in southern Italy, situated on a small promontory in a bay of the Adriatic Sea, 45 miles east-northeast of Taranto. In ancient times Brundusium was one of the most important cities of Calabria. It was one of the chief cities of the Sallentines, and the excellence of its port and commanding situation in the Adriatic were among the chief inducements to the Romans to attack them. Having conquered the city in 267 B.C., the Romans made it a naval station, and it was the scene of important operations in the war between Cæsar and Pompey. In 230 B.C., Brindisi was the starting place of the Roman troops that took part in the first Illyrian War; and from this point the Romans nearly always directed subsequent wars with Macedonia, Greece and Asia. Pacuvius was born there. Horace, who made a journey there in 38 or 37 B.C. has made the visit one of his satires (Sat. I, 5). Virgil died here 19 B.C. On the fall of the Western empire it declined in importance. In the 11th century it fell into the possession of the Normans, and became one of the chief ports of embarkation for the Crusades. Its importance as a seaport was subsequently completely lost, and its harbor blocked. In 1870 the Peninsular & Oriental Steam Navigation Company put on a weekly line of steamers between Brindisi and Alexandria, and Brindisi is now an important station for passengers and mails to and from India and the East. There is also a trade with British, Austrian and other ports. Latterly, the harbor accommodation has been considerably improved. It is used now (1918) as a torpedo station for the Italian navy. The chief exports are wine, olive-oil and figs; the chief import, coal. The principal buildings are the cathedral, where the Emperor Frederick II was married to Yolande in 1225; and the castle, commenced by Frederick II and finished by Charles V. Chief among the ancient remains is a column 62 feet high, one of two, which, tradition says, marked the end of the Appian Way. Pop. 25,317.

BRINDLEY, James, English engineer: b. Thornsett, Derbyshire, 1716; d. Turnhurst, Staffordshire, 30 Sept. 1772. At 17 he became apprentice to a millwright, and on the expiration of his indentures began business as an engineer, and in 1752 displayed great talent in contriving a water-engine for draining a coal-mine. Several important inventions introduced him to the patronage of the Duke of Bridgewater, then occupied in planning a communication between his estate at Worsley and the towns of Manchester and Liverpool by water. This immense work, ridiculed by scientific men of the period as impracticable, Brindley undertook and carried out by means of aqueducts over valleys, rivers, etc. The first portion of the Bridgewater Canal (to Manchester) was opened in 1761, the whole system being complete in the end of 1772. He also commenced the Grand Trunk Canal and completed the Birmingham, Chesterfield and others. Consult Smiles, Samuel, ‘Lives of the Engineers’ (Vol. I, London 1861–62).

BRINE SHRIMP, the only animal, except a species of fly (*Ephydra*), which lives in the Great Salt Lake of Utah. It is a phyllopod crustacean, with stalked eyes, a delicate, slender body, which is provided with 11 pairs of broad, paddle-like or leaf-like feet. It is about one-quarter of an inch long. Similar forms live in brine vats in various parts of the world. *Artemia fertilis* abounds in Great Salt Lake. It may often be seen swimming about in pairs and has a nauplius young like that of the brine shrimp of Europe. It produces young by budding (parthenogenesis), as well as from eggs. A species observed near Odessa produced females alone in warm weather; and only in water of medium strength were males produced. The eggs of *A. fertilis* have been sent in moist mud from Utah to Munich, Germany, and specimens raised from the eggs by Siebold, proving the great vitality of the eggs of these Phyllopods, a fact paralleled by the similar vitality of the eggs of the king-crab. *A. gracilis* of Verrill has thus far only been found in tubs of concentrated salt water on railroad bridges in New England. This species is able to accommodate itself to changes in the density of water. They can be brought to a state in which they resemble closely *Branchipas stagnalis,* a fresh water brachiopod. This is cited often as a proof of the effect of environment on the structure of animals and its bearing on the theory of evolution is an immediate corollary.

BRINK, Bernhard Ten, German philologist and expositor of English literature: b. Amsterdam 1841; d. Strassburg 1892. He studied at Munster and Bonn; from 1870 to 1873 was professor of modern languages at the University of Marburg, and from 1873 to 1892 professor of English at Strassburg. From 1874 he edited *Quellen und Forschungen zur Sprach- und Culturgeschichte der germanischen Völker.* His published works include ‘Geschichte der englischen Litteratur’ (Vol. I, Chaucer to Wiclif 1877; English translation by H. M. Kennedy, 1883; Vol. II, from Wiclif to the accession of Elizabeth, 1896), considered to be one of the best histories of early English literature. He also wrote ‘Chaucer's Sprache und Verskunst’ (1884; 2d ed., 1899; English translation ‘The Language and Metre of Chaucer’ by M. B. Smith, 2d rev. ed., 1901); ‘Beowulf, Untersuchungen’ (1888); ‘Shakespeare, Fünf Vorlesungen’ (1893); English translation ‘Five Lectures on Shakespeare’ by Julia Franklin (1895).

BRINK, Jan Ten, Dutch scholar and author: b. Appingedam 1834; d. 1901. He received a theological training at Utrecht; in 1860 was a tutor in Batavia and in 1862–84 served as instructor of the Dutch language and literature at the Hague Gymnasium. In 1884 he became professor at Leyden. He is the author of several studies in literary criticism and stories, including ‘Bulwer Lytton, Biographie en Kritiek’ (1873); ‘Letterkundige schetsen’ (2 pts., 1874–75); ‘Geschiedenis der Noord-Nederlandsche letteren in de XIX. eeuw’ (3 vols., 1888–89; new ed., 1904); ‘Romans en novellen’ (13 vols., 1885). His complete works in *belles lettres* have appeared in 17 volumes as ‘Litterarische schetsen en kritieken’ (Leyden 1882–88).

BRINKERHOFF, Roeliff B., American lawyer, banker, philanthropist and prison reformer: b. Owasco, N. Y., 28 June 1828; d. 4 June 1911. He received a public school education; for three years was a tutor in the home of President Jackson; became a lawyer at Mansfield, Ohio, in 1852; was editor and proprietor of the Mansfield *Herald* 1855–59; and enlisted in the volunteer army in the Civil War. From first lieutenant he advanced to the rank of colonel, and was made brigadier-general for meritorious service. He resumed law practice until 1873 when he became a banker. He was the leading figure in the National Prison Congresses for several years and was an active propagandist for prison reform. Besides numerous contributions to periodical literature on his favorite subject, his published writings include ‹The Volunteer Quartermaster› (1883) and ‹Recollections of a Lifetime› (1900). Consult ‹Gen. Roeliff Brinkerhoff in Memoriam› (Columbus, Ohio, 1911).

BRINKLEY, Frank, English editor: b. Ireland 1844; d. 28 Oct. 1912. He entered the army, and went to Japan in 1867 with the battery of Royal Artillery sent to protect the European residents. He was subsequently lent to the Japanese army for instructional purposes and became professor in Tokio Military School. He founded the *Japanese Mail* in 1881, and continued to edit it till his death. He was the author of ‹Japan› (1901); ‹Japan and China› (1903); and an ‹Unabridged Japanese-Chinese Dictionary.›

BRINTON, Daniel Garrison, American surgeon, archæologist and ethnologist: b. Thornbury, Pa., 13 May 1837; d. Atlantic City, N. J., 31 July 1899. He was graduated at Yale in 1858 and at Jefferson Medical College in 1861, and subsequently studied at Paris and Heidelberg. During the Civil War he was a surgeon in the Union army, and from 1867 to 1887 was editor of the *Medical and Surgical Reporter.* In 1884 he was appointed professor of ethnology at the Academy of Natural Sciences in Philadelphia; and, in 1886, professor of American linguistics and archæology in the University of Pennsylvania. In 1894 he was president of the American Association for the Advancement of Science. Among his many works are notes on the ‹Floridian Peninsula› (1859); ‹The Myths of the New World› (1868, 3d ed., 1896); ‹American Hero Myths› (1882); ‹Aboriginal American Anthology›; ‹Primer of Mayan Hieroglyphics› (1896); ‹Religions of Primitive Peoples› (1897); ‹The Basis of Social Relations› (1902). He edited ‹The Library of Aboriginal American Literature› in eight volumes (1882–85), and was a high authority on all American archæological topics. Just before his death, he gave his entire library to the University of Pennsylvania.

BRINTON, John Hill, American surgeon: b. Philadelphia 1832; d. 1907. He was graduated at the University of Pennsylvania (1850), and at the Jefferson Medical College (1852), serving through the Civil War as a surgeon. In 1882 he was appointed professor of the practice of surgery and clinical surgery at Jefferson Medical College. He has written ‹Consolidated Statement of Gunshot Wounds› (1863); with J. H. Porter, ‹History of the Organization of the Medical Department of the United States Army› (1864), a MS in the surgeon-general's library at Washington; ‹Description of a Valve at the Termination of the Right Spermatic Vein in the Vena Cava› (1856); ‹Operative Surgery in General› (1881); ‹The March of Surgery› (1882).

BRINVILLIERS, brăṅ-vẹ-yā, **Marie Madeleine Marguerite d'Aubray** (MARQUISE DE), French poisoner: b. Paris, about 1630; executed 16 July 1676. She was the daughter of a civil-lieutenant of Paris, and married in 1651 the Marquis of Brinvilliers. About 1659 the Marquis introduced to his house a young cavalry officer, named Godin de Sainte-Croix, for whom his wife conceived a violent passion. The Marquis, occupied with his own pleasures, seemed indifferent, but her brothers remonstrated, and her father, scandalized at her misconduct, had Sainte-Croix openly arrested in her carriage and taken to the Bastile in 1665. Sainte-Croix remained in prison about a year, and made there the acquaintance of an Italian, who taught him the art of preparing poisons. On his liberation he imparted his discoveries to Madame de Brinvilliers, who had in the meantime assumed an air of piety, visiting the hospitals and ministering to the sick, and had thus reconciled herself to her family; but the affront offered her by her father remained in her mind, and she had resolved to avenge it. Sainte-Croix, apparently from cupidity, seconded her design. He supplied her with poisons, with which she experimented first on the patients in the hospital. She occupied eight months in administering poison to her father, and at last killed him suddenly without being suspected. By the aid of Lachaussée, an old domestic of Sainte-Croix, whom she caused to enter their service, she also succeeded in poisoning her brothers. She is said to have attempted her husband, with a view to marry Sainte-Croix, but did not succeed. Sainte-Croix died suddenly, it is said from the falling off of a mask of glass which he used to protect himself in preparing a subtle poison. A packet addressed to Madame Brinvilliers, containing poisons labeled with descriptions of their effects, revealed their conspiracy. Among a number of letters there was one containing a promise of $6,000, which Sainte-Croix had exacted as the price of his assistance. Madame Brinvilliers fled to Liège, and took refuge in a convent. Her extradition being obtained, she was inveigled from the convent by a pretended lover, brought to Paris, and on the evidence of Lachaussée, together with her own confession, condemned to be beheaded and afterward burned. Her exposure soon led to the discovery of the famous poisoner La Voisin. Consult Pirot, ‹La Marquise de Brinvilliers› (Paris 1883).

BRION, brē-ôn', **Friedrike, Elizabeth,** German lady: b. Niederrödern, Alsace, 1752; d. 1813. To her Goethe dedicated several lyrics and she is the supposed original of Maria, in ‹Götz von Berlichingen,› as well as of Gretchen in ‹Faust.› She figures in a well-known episode in Goethe's ‹Dichtung und Wahrheit,› and is often styled from her place of residence, «Friederike von Sesenheim.» Consult Düntzer, ‹Frederike von Sesenheim in Lichte der Wahrheit› (Stuttgart 1893), and Bielchowsky, A., ‹Frederike und Lili› (Munich 1906).

BRION, Gustave, French artist: b. Rothau, Alsace, 24 Oct. 1824; d. Paris, 4 Nov. 1877. He studied at Strassburg with Gabriel Guérin and the sculptor Andreas Friedrich. He is noted for his Alsatian scenes and many of his works are to be found in American collections. Among them are ‹A Marriage in Alsace› and ‹The Sixth Day of Creation.› He illustrated Hugo's ‹Les Misérables› and ‹Notre Dame de Paris.›

BRION, Luis, Colombian admiral: b. Curaçao, 6 July 1782; d. 20 Sept. 1821. He was sent at an early age to Holland to receive his education, his father being a native of that country, and there entered the Dutch army. He was offered a commission in 1799, but being recalled by his parents, returned to Curaçao. Receiving permission from his parents, he visited the United States, where he studied navigation. Upon the death of his father, who bequeathed him a large fortune, he bought a vessel and made several voyages; entering into speculation on his own account, he was very successful, and returned to Curaçao in 1804, where he established a mercantile house. The political events in Venezuela of 1808–10 brought Brion rapidly into notice; he volunteered his services to the republic of Caracas, and in 1811 was appointed captain of a frigate. He now devoted all his resources and his energies to the patriotic cause. At his own expense he fitted out a fleet of vessels, and attacked the Spanish forces at the Island of Marguerite, where he gained a signal victory. Brion distinguished himself at the conquest of Guiana, and also at Santa Marta and Cartagena. He sat in the Congress of Angostura which proclaimed the independence of Colombia. During a residence at Savanilla he reduced the custom-house duties; this coming to the ear of Bolivar, he directly countermanded the order, which so preyed upon the mind of Brion, that he became ill, and leaving the squadron returned to Curaçao, and soon died in poverty.

BRIOSCO, brẹ-ŏs'kō, **Andrea,** Italian sculptor and architect: b. Padua 1470; d. 1532. He designed the church of Santa Giustina at Padua as well as a celebrated candelabrum in the church of San Antonio there; and the Delle Torre tombs in San Ferno at Verona.

BRIOUDE, brē-ood, France, town in the department of Haute Loire, capital of the arrondissement of the same name, situated near the left bank of the river Allier, on the site of the ancient town of Brivas. To Americans the town is of interest as the town nearest Chavagnac, the birthplace of Lafayette. A considerable traffic in grain, hemp and wine is carried on here. Pop. 5,000.

BRIQUETTES, a form of fuel artificially molded from coal dust and fragments, peat powder, lignite, etc., with the addition of some combustible binding material. The coal waste or slack is first washed and then dried in a rotating drum at a temperature ranging up to 500° F., until not more than 2 per cent of moisture remains. It is then subjected to a blowing process which carries off most of the impurities — and in some cases considerable fine coal dust which is caught in baffle bins. The binder is added in proper proportion while the coal is hot, and the mass is mixed thoroughly by paddles and then sent into a heavy edge-runner mill where the constituents are ground into an intimate mixture. As it passes through this process it is kept hot by injections of live steam. The hot mixture is then passed to the molding rolls where it receives the desired shape at a pressure of from 3,500 to 5,000 pounds per square inch. The «fins» remaining from inexact registering of the molding rollers are broken off by shaking on a revolving screen, and the briquettes are then allowed to cool and are ready for shipment.

Many substances have been used as binders, and most of them have been discarded for various reasons: they were too soft and melted down on the fire; or they made a heavy black smoke; or gave off an offensive smell; or burnt out too fast, leaving the coal unconsumed. The binders most commonly used by briquette manufacturers in the United States are coal-tar pitch, asphaltic pitch or a mixture of the two. A comparatively new binder is the residuum of petroleum distillation known as hydrolene oil. This substance is solid up to 160° F., and only 5 per cent of the weight of the coal is needed to make the briquettes — as compared with 10 per cent in the case of pitch. These hydrolene briquettes give off very little smoke, which is quickly dissipated, and their heat value is higher than anthracite. They are particularly well suited to domestic use. In briquetting lignite coal no binder is needed, the natural bitumen being developed by the process into a sufficient binder.

Production.— There were 15 briquetting plants in operation in the United States in 1916, with a combined output of 295,155 tons, valued at $1,445,662. Of the whole, 65,337 tons were of anthracite culm; 136,358 tons were of semi-anthracite, semi-bituminous and bituminous slack; and 88,731 tons of lignite and oil-gas residuum. The quantity of binders added accounts for the remainder of 4,929 tons. The production and use of briquetted fuel is much larger in Europe, the annual output being about 10,000,000 tons. Nearly the whole English product is exported. Consult Franke, G., ‹A Handbook of Briquetting› (London 1917). See FUEL.

BRISACH. See BREISACH.

BRISBANE, Abbott Hall, American military engineer: b. South Carolina; d. Summerville, S. C., 28 Sept. 1861. He was graduated at the United States Military Academy in 1825, and appointed 2d lieutenant of the 3d artillery, serving on topographical duty in the city of Washington, and afterward with the engineer, Bernard, on the South Atlantic coast until the close of the year 1827, when he resigned. He served in the Florida War against the Seminole Indians in 1835–36 as colonel of South Carolina volunteers, and was engaged in the skirmish of Tomoka, 10 March 1836. After the war he turned his attention, as engineer, to a projected railroad from Charleston, S. C., to Cincinnati, Ohio, having especially entrusted to him the examination of the mountain-passes through which it was to run. He received the appointment of constructing engineer of the projected road, which place he held from 1836 till 1840. He was also chief engineer of the Ocmulgee and Flint Railroad, Ga., in 1840–44. In 1847–48 he was superintending engineer of an artesian well for the supply of water to the city of Charleston, and he then accepted the chair of *belles-lettres* and ethics in the South Carolina Military Academy, occupying the place from 1848 to 1853, after which he retired to his plantation near Charleston. He was the author of a political romance, ‹Ralphton, or the Young Carolinian of 1776.›

BRISBANE, Arthur, American newspaper editor: b. Buffalo, N. Y., 12 Dec. 1864. He received his education in the public schools and spent five years in France and Germany. He began his newspaper career in 1882 as a reporter on the New York *Sun,* of which journal he was afterward London correspondent. He edited the *Evening Sun* for some time and for seven years was managing editor of different editions of the New York *World.* In 1897 began his connection with the Hearst papers as editor of the New York *Evening Journal.* The immense circulation of the Hearst chain of newspapers has given Brisbane the widest and most far-reaching influence of any editor in the United States. By the plutocratic element he is regarded as the wielder of a pernicious influence on the less educated masses of the people while among the great masses he is regarded as a kind of apostle of industrial and political freedom. He lectured in the School of Journalism of Columbia University in 1913 and has published 'Editorials from the Hearst Papers' and 'Mary Baker Eddy' (1908).

BRISBANE, Sir **Thomas MacDougall,** Scottish general and astronomer: b. Brisbane, near Largs, the seat of his family, 23 July 1773; d. there, 27 Jan. 1860. He entered the army and in 1793 took part in all the engagements of the campaign in Flanders. In 1796 he was sent to the West Indies, and in 1812 commanded a brigade under the Duke of Wellington in Spain. He took part in the battles of Vittoria, Orthes and Toulouse, and received the thanks of Parliament for conspicuous bravery at the battle of the Nive. On the abdication of Napoleon he was sent to America. In 1821 he was appointed governor of New South Wales, which post he continued to occupy for four years. His administration was active and intelligent, and tended greatly to promote the prosperity of the colony. He introduced at his own expense a good breed of horses, and promoted the cultivation of the vine, as well as of sugar, cotton and tobacco. At the same time he devoted himself with great diligence to the study of astronomy. He had an observatory erected at his residence of Paramatta, and catalogued 7,385 stars, until then scarcely known to astronomers. For this great work, known as the 'Brisbane Catalogue of Stars,' he received the Copley medal of the Royal Society. Immigration began at this period but he unwisely gave so much power to the immigrants that general confusion resulted and he was recalled at the end of 1825. On his return to Scotland he devoted himself entirely to science. He had an astronomical, and later a magnetic, observatory established at his residence at Makerstoun. The observations which he made there, with the aid of able assistants, fill three large volumes. He was made a baronet in 1836, G.C.B. in the following year; received from Oxford the degree of D.C.L. and succeeded Sir Walter Scott as president of the Royal Society of Edinburgh. He founded two gold medals for scientific merit, one in the gift of the Royal Society, the other in that of the Society of Arts.

BRISBANE, the capital of the colony of Queensland, Australia, on the Brisbane River, about 25 miles by water from its mouth in Moreton Bay, and about 500 miles north of Sydney. It was named in honor of Sir Thomas Brisbane (q.v.). Of the four parts into which the town is divided, North Brisbane is situated in the heart of the city, on the north bank of the river, and South Brisbane faces it on the south. Fortitude Valley is a large division on the north bank, to the east and northeast of North Brisbane, mostly situated on a peninsula formed by the winding of the river. The fourth division, Kangaroo Point, is on the south bank, comprising a point of land projecting between North Brisbane and the above peninsula. The streets are laid out as regularly as the tortuous course of the river will permit. The chief buildings are situated in North Brisbane, among them being Parliament House, where the legislature sits; Government House, in the Botanic Gardens; the government offices; the Supreme Court; the post-office; the technical college; the treasury buildings, a large structure of great architectural beauty; the old and the new town-hall; and the customs-house. Many of the banks have fine edifices, particularly the Queensland National Bank. The chief educational institutions are the Normal School, the boys' and girl's grammar schools and the school of the Christian Brothers. Other buildings and institutions are the masonic and temperance halls; the School of Arts, with a good library; the museum; the Queensland Club; the large general hospital, and several special hospitals; an orphanage and a large jail in South Brisbane; the opera house, one of the best theatres in Australia. The Victoria Bridge connects South with North Brisbane. It cost upward of $555,000, and replaces an older one destroyed by a flood in 1893. It consists of six steel spans supported on five cast-iron cylinders filled with concrete, the abutments being of masonry and concrete; and the total length is about 1,041 feet. Much of the cross-river traffic is carried on by the ferries. The leading parks and gardens are the Botanic Gardens, with the Queen's Park, in North Brisbane, at the river-side, finely laid out; Victoria Park, to the north of North Brisbane; Albert Park, Mount Coot-tha, Bowen Park and the gardens of the Acclimatization Society in Fortitude Valley; and Musgrave, Dutton and Woolloongabba parks in South Brisbane. There is extensive wharf accommodation, and South Brisbane has a dry-dock. There is regular steamer connection with Sydney, London and elsewhere, and adequate railway communication with Sydney and other chief towns in Australia. The climate is dry and healthy, but the temperature is often very high during the summer. Among the industrial establishments are a sugar-refinery, tobacco factories, flour-mills, boot factories, breweries, tanneries. The trade is important, among the exports being gold, wool, sugar, etc. Originally founded as a penal settlement in 1825, and abandoned in 1839, its growth began in 1842 with the arrival of free settlers, and in 1859 it became the capital of Queensland. South Brisbane became a separate municipality in 1888 and a city in 1903. A United States consul is stationed here. Pop. about 145,000.

BRISCOE, Margaret Sutton. See Hopkins, Margaret Sutton Briscoe.

BRISEIS, a girl of Lyrnessus, called also Hippodamia. When her country was taken by the Greeks, she fell to the share of Achilles in the division of the spoils. When Agamemnon was obliged to restore Chryseis to her father, he took Briseis from Achilles in recompense and Achilles thereupon made a vow to absent himself from the field of battle at Troy. This incident Homer makes one of the moving features of his ‘Iliad.’

BRISGAU, brēz'gow, or **BREISGAU**, a district of the state of Baden, between the Rhine and the Black Forest, which, with the district of Ortenau, formerly constituted a landgraviate in the southwestern part of Swabia. This is one of the most fertile parts of Germany. Though chiefly in possession of Austria since the 15th century, it was governed by its own laws. The earliest recorded Count is Birtilo (962–95), ancestor of the counts and dukes of Zähringen. At the Peace of Lunéville (1801) Austria ceded Brisgau, one of the oldest possessions of the house of Hapsburg, to the Duke of Modena, after whose death it fell to his son-in-law, the Archduke Ferdinand of Austria, as Duke of Brisgau. By the Peace of Presburg (1805) it was divided between Baden and Württemberg, and in 1810, it was ceded entirely to Baden with the exception of a small part, and still belongs to that state.

BRISSAC, brē-säc, **Comte de.** See Cossé, Charles de.

BRISSON, brē-sôṅ, **Barnabé**, French jurist: b. 1531; d. 15 Nov. 1591. Henry III commissioned him to collect and edit the ordinances of his predecessors and his own, which appeared under the title ‘Code de Henri III.’ He was made King's advocate in 1575 and eight years later president of a rural tribunal. He was sent on several diplomatic missions, one to England to arrange for the marriage of Elizabeth and the Duke of Anjou. Brisson remained in Paris in 1588, after Henry III had fled and made an earnest attempt to settle the trouble between the King and the Commons. In 1589, he was made first president of the Parliament, and after Henry's death, in August of the same year, proclaimed the Duc de Mayenne, the chief of the League, lieutenant-general of the kingdom. Brisson soon after became suspected by the faction of the «Sixteen,» who ruled in Paris, and who thought that he was favorable to Henry IV. He was accordingly arrested and summarily hanged. Among his works of importance are ‘De Verborum quæ ad Jus Pertinent Significatione, etc.’ (1557); ‘Observationum Divini et Humani Juris Liber’ (1564); ‘De Formulis et Solemnibus Populi Romani Verbis, etc.,’ (1583), still in use, last edited by Conrad 1781; ‘Opera Minora’ (1606). Consult Le Bas, ‘Dictionnaire encyclopédique de la France’ (Vol. III, Paris 1835–63).

BRISSON, Eugène Henri, French politician and journalist: b. Bourges, 31 July 1835. He entered the Chamber of Deputies in 1871, and won much attention by urging amnesty for the Communists and other political offenders. Since then he has been one of the foremost members of the Radical party. He was elected president of the Chamber in 1881, and retained that office until the overthrow of the Ferry ministry, in 1885, when he accepted the premiership. He was re-elected to the presidency of the Chamber in 1894, and, in 1895, he retired from the ministry and was a conspicuous candidate for the presidency of France. In 1898 he again accepted the premiership, but his cabinet was soon overthrown. On 8 June 1906 he was elected president of the House.

BRISSON, Mathurin Jacques, French savant: b. Fontenay-le-Comte, 30 April 1723; d. Croissy, near Paris, 23 June 1806. He was instructor to the children of the royal family of France in physics and natural history. His works on natural history include ‘Le Règne animal’ (1756). He was also censor royal, member of the Academy of Sciences and of the Institute, and succeeded Nollet in the chair of natural philosophy at the College of Navarre. He translated Priestley's work on ‘Electricity,’ although he opposed his theories, and still more those of Franklin. The most able of his writings are on specific gravity and on ornithology. Buffon quotes frequently from Brisson's ‘Ornithologie’ (1760). He published in 1800 a ‘Dictionnaire raisonné de physique.’

BRISSOT DE WARVILLE, brē-sō dė vär-vēl, **Félix Saturnin**, French animal painter: b. Lens 1818. He entered the Ecole des Beaux-Arts in 1835 and studied with L. Cogniet. His paintings are renowned for their truthful representations of nature, their scenes being laid chiefly in Touraine and Normandy, or in the forests of Fontainebleau and Compiègne. Among them are ‘The Thicket’ (1881); ‘Return of the Flock’ (1885); ‘A Corner of the Sheepfold’ (1888). He has also published an album of lithographs representing ‘The Principal Scenes in the Forest of Compiègne.’

BRISSOT DE WARVILLE, Jean Pierre, French political writer, and one of the leaders of the Girondists (q.v.): b. Ouarville, near Chartres, 14 Jan. 1754; d. Paris, 30 Oct. 1793. He took the name D'Ouarville, which he afterward anglicized into De Warville, from the village of Ouarville, where he was born. He was designed for the law, and placed with a procurator in Paris; but early turned his attention to public affairs, associating himself with such men as Pétion, Robespierre, Marat, etc. In 1780 he published his ‘Théorie des lois criminelles,’ and two years afterward an important collection called the ‘Bibliothèque des lois criminelles.’ During this period he edited for a time, at Boulogne-sur-Mer, the *Courier de l'Europe,* a translation from an English journal. He also visited England, where he endeavored to found a lyceum and establish a journal in connection with it. Failing in this enterprise, he returned to Paris, where his works had already classed him among the philanthropic theorists of the day. He was suspected of the authorship of an anonymous pamphlet, and thrown into the Bastile. On his liberation he engaged with Clavières and Mirabeau in some works on finance, which appeared under the name of the latter. Threatened with a new arrest, he escaped to England, and being there introduced to the Society for the Abolition of Negro Slavery, resolved to form a similar society in Paris. This society, which numbered many distinguished names among its members, and ultimately accomplished its object, he founded along with Clavières, Mirabeau and others, and undertook a voyage to the United States to study on its behalf the problem of emancipation. On his return the Revolution was about to break out, and Brissot embraced it with ardor. He was not a member of the States-General, but was elected to the National Assembly for Paris and to the Convention for the department of the Eure et Loir. He established a journal, *Le Patriote Français,* which at once became the recognized organ of the Republicans. As leader of the Girondist party, his history belongs henceforward to the history of France. He voted, out of policy, for the death of Louis XVI, but urged a confirmation by the vote of the people; and he caused war to be declared against Holland and England in February 1793. This was his last political act. Until the close of his career he was engaged in defending himself against the Montagnards. When the Jacobins came into power, he was guillotined with 20 other Girondist leaders. Brissot was inferior to Vergniaud as an orator, but his writings exercised a powerful influence on the Revolution. In the early part of his career his opinions were very extreme. In a passage, afterward used against him, he carried his advocacy of individual rights so far as to justify not only theft, but cannibalism. Proudhon was accused of having borrowed from him the maxim, «La propriété c'est le vol.» His 'Mémoires pour servir à l'histoire de la Révolution' appeared in 1830 at Paris in four volumes (new edition by Lescure, 1877). Consult Desmoulins, 'The History of the Brissotins' (translated from the French, London 1794).

BRISSOTINS, brē-sŏ-tăn. See GIRONDISTS.

BRISTED, Charles Astor, American author: b. New York 1820; d. Washington, D. C., 15 Jan. 1874. He was the son of the Rev. John Bristed and grandson of John Jacob Astor, founder of the Astor Library. He was graduated with high honors at Yale in 1839, and then spent five years at Trinity College, Cambridge, England, where he took a number of prizes and became a foundation scholar. He traveled extensively and contributed many papers on light social topics and ephemeral subjects to the magazines of England and America under the signature «Carl Benson.» His wide culture and exact scholarship made his work attractive to all cultivated readers. He wrote 'Selections from Catullus' (1849); 'Letters to Horace Mann' (1850), a reply to certain attacks on Stephen Girard and J. J. Astor; 'The Upper Ten Thousand' (1852); 'Five Years in the English University' (1852), his most important book; 'Pieces of a Broken-Down Critic' (1857)); 'Letter to Dr. Henry Halford Jones (that is, Dr. J. G. Holland), editor of the *Wintertown Democrat* (that is, *Springfield Republican*), concerning his habit of giving Advice to Everybody and His Qualifications for the Task' (1864); 'The Interference Theory of Government' (1867).

BRISTLETAILS, wingless insects of the order *Thysanura.* These agile creatures have a long flattened body, with metallic scales, in form somewhat like those of butterflies. The antennæ are very long, setiform, many-jointed; the mouth-parts are free, with long palpi, the maxillary palpi being seven-jointed and the labial palpi four-jointed. The mandibles are stout, sunken in the head and armed with teeth for gnawing. The prothorax is very large, and all the rings of the body are of much the same size, so that the insect bears a general resemblance to the myriapods. The anal stylets are long and large, which, with the smaller ones inserted on the subterminal rings of the abdomen, aid greatly in locomotion, though these insects run with great rapidity and do not leap like the *Poduridæ,* and thus remind us, as well as in their general appearance, of certain wingless cockroaches. Like cockroaches in one of its habits also is *Thermobia domestica,* which abounds in the chinks and crannies of the rooms of houses, and comes out at night, shunning the light. The «silver witch» (*Lepisma saccharina*) is not uncommon in old, damp houses, where it has the habits of the cockroach, eating cloths, tapestry, etc. In general form, *Lepisma* may be compared to the larva of *Perla,* a net-veined neuropterous insect. The body is long and narrow, covered with rather coarse scales and ends in three many-jointed anal stylets, or bristles, which closely resemble the many-jointed antennæ, which are remarkably long and slender. They undergo no metamorphosis. Consult Packard, 'Our Common Insects' (1873); Sharp, 'Insects' (1899).

BRISTLES, the stiff hairs which grow on the back of the hog and are used to a great extent in the manufacture of brushes. They are of several varieties of color and quality, distinguished as black, gray, yellow, white and lilies. The last is the soft, silvery quality used for shaving-brushes. Russia and Germany are the chief sources of supply, but they are also obtained from France and Belgium and bristles of inferior quality have recently been received from China, which constitute from 60 to 75 per cent of all the bristles used for paint brushes in this country. The quality of bristles depends on the length, stiffness, color and straightness — white being the most valuable. The best bristles are produced by hogs that inhabit cold countries, for these are leaner. In the summer the hogs are driven in herds through the forests to feed on soft roots, etc., when they shed their bristles by rubbing up against trees. In American slaughter-houses the hog bristles form a by-product, but those from the modern hog are very inferior. In 1916 the imports of bristles into the United States amounted to 3,936,461 pounds and were valued at $3,627,042.

BRISTOL, Charles Lawrence, American biologist: b. Ballston Spa, N. Y., 29 Sept. 1859. A graduate of New York University, he became instructor in science at Riverview Academy 1884–87, and professor of zoology at the University of South Dakota 1887–91. After further study at Clark University and the University of Chicago, he was appointed professor of biology at New York University in 1894, and became widely known in connection with zoological work in the Bermudas and the transportation of live tropical marine animals to the New York Aquarium. He is author of 'The Metamerism of Nephelis' (1899), and 'Treasures of the New York Aquarium' (*Century Magazine,* 1899).

BRISTOL, Frank Milton, Methodist Episcopal bishop: b. Orleans County, N. Y., 4 Jan. 1851; pastor successively of Trinity Church, Chicago; First Church, Evanston, Ill.; Metropolitan Church, Washington. He was elected bishop in 1908. Among his numerous works are ‘Addresses,’ ‘Shakespeare and America,’ ‘Providential Epochs’ and ‘The Ministry of Art.’

BRISTOL, Conn., city in Hartford County, on the New York, N. H. & H. Railroad, 18 miles west of Hartford. It has a public library, a high school and 12 grammar schools, two parochial schools, a business college, 15 churches, electric light and street railroad plants; national and savings banks. Among the public buildings are the townhall, the emergency hospital, post-office, Masonic Temple, Red Men's and Odd Fellows' halls and the armory. There are manufactures of clocks, watches, hardware, castings,, shears, steel springs, saws, lamps, cow stanchions, glass cutters, paper boxes, silverware, underwear, monumental works and cigars; steel-rolling mills, iron and brass foundries. The value of taxable property is $15,633,841. Bristol was incorporated in 1785, as a borough in 1893, and as a city in 1911; in which year it adopted the commission form of government. The government expenses amounted in 1915 to $498,191, the receipts to $510,587. Pop. 20,620. Consult ‘Souvenir History of the Town of Bristol, Connecticut’ (Meriden 1897).

BRISTOL, England, a city and seaport, situated partly in Gloucestershire, partly in Somerset, but forming a county in itself. It stands on the confluence of the rivers Avon and Frome, whence the Avon pursues a course of nearly seven miles to the Severn. The Avon is a navigable river and the tide rises in it to a great height. Bristol is 118 miles due west from London, or three hours by rail. It stands partly on a number of eminences, partly on the lower ground at their foot. The manufacturing and business parts are on the lower levels, while the hills are now almost wholly covered with private houses. The districts of Clifton, Redland and Cotham, situated within the limits of the borough and in the midst of charming scenery, are studded with mansions and villas, the attractions of these portions of the city being greatly increased by the Clifton and Durdham Downs. The bed of the river Avon is situated about 315 feet below the summit of Clifton Down, from which a handsome suspension bridge is thrown across the river, uniting the two counties. Its length from the centres of the piers is 703 feet, its height above high-water mark 245 feet.

Area.— By the Boundaries Extension Bill of 1904 the city covered an area of 17,004 acres. The area of the present county borough is 17,460 acres, and according to the census of 1911 it had a population of 357,048. In 1915 the population was estimated at 363,312, with a ratable value of £1,862,522 ($9,312,610). As compared with the period of the Municipal Corporations Reform Act of 1835 when the area was increased from 755 to 4,461 acres, it will be seen that the size of the city has increased nearly fourfold in less than three-quarters of a century.

Geology.— The geological features of Bristol are of varied interest. Within a radius of five miles a complete series of rocks from the upper part of the old red sandstone to the top of the coal measures, and from the new red sandstone to the inferior oolite, is directly accessible to study in numerous quarries and the fine cliffs of the Avon Gorge. The geology of Bristol may be studied in the ‘Memoirs of the Geological Survey for 1876’ in Sanders's Geological Map of Bristol, and in the Geological Survey Maps.

Churches, Hospitals, Etc.— Bristol is rich in ancient architecture, both ecclesiastical and domestic. The cathedral, founded in 1142, was originally an abbey church. It exhibits various styles of architecture, the chapter house and its vestibule being Norman; the Lady chapel early English; the chancel and choir, the Berkeley and Newton chapels decorated; the groining of the transepts, the central tower and cloisters perpendicular. The nave, its aisles and western towers are modern additions, having been erected at intervals since 1865. There are several fine old churches, but they are all excelled by Saint Mary Redcliffe, perhaps the finest parish church in the kingdom. It is commonly said to have been founded by Simon de Burton, about 1293, but part of it is considerably older than this and is believed to be as old as 1200. It is cruciform, with western tower and spire 285 feet. The western door is the principal entrance, but there are also porches on the northern and southern sides. The south porch, the south transept, the tower and much of the lower part of the church belong to the decorated style, and the exterior of the north porch is an excellent specimen of it, the interior being very beautiful early English. The remainder of the church, including the Clerestory, is of the Perpendicular Period. William Cañynge, five times mayor of Bristol, whose name is so prominent in the Chatterton controversy, is said to have restored this church about 1445–47. Other churches worthy of mention are Temple Church, with its leaning tower; Saint Stephen's, All-Saints', Saint Mary-le-Port, Saint Phillip's, Saint James and Saint John. Under the tower of this last church was one of the entrances to the ancient city of Bristol, and the gateway still exists. The Independents, Baptists and Wesleyans have some noteworthy chapels. The Roman Catholics have a pro-cathedral in Clifton and several chapels and convents; altogether between 200 and 300 separate buildings in the city are dedicated to the cause of Christianity.

Saint Peter's Hospital adjacent to the church of Saint Peter, the seat of the poor law administration, is a very fine example of early domestic architecture. The buildings of various banks and insurance offices in Corn street and Clare street are worthy of notice from a modern architectural point of view.

Libraries.—The most modern public building is the Bristol Central Library adjoining the Bristol Cathedral, completed in 1906, from designs by Mr. Percy Adams, F.R.I.B.A. A public library existed in Bristol early in the 15th century, and as no other record can be found of any such library prior to this in any part of England, the claim of the earliest in the kingdom must belong to Bristol. The library was that of the Kalendars, a brotherhood of clergy and laity who were attached to the church of All-Hallows or All-Saints', still standing in Corn street. In 1613 the existing City Library was founded. Dr. Tobias Mathew, archbishop of York at this time, gave a number of books, to which he added subsequently a considerable portion of his library «for the free use of merchants and shopkeepers of the city.» In 1740 the building still standing in King street was erected, minus the wing. In 1874 the Public Libraries Act was adopted and two years later the building was opened under the act as the Bristol Central Library. The year 1906 saw the opening of the New Central Libraries in Cottage Green, a palatial building erected by the munificent bequest of a wealthy citizen, Mr. Vincent Stuckey Lean. The salient features of the historic King Street Library are preserved in this building in the «Bristol Library,» an apartment exactly reproducing the original room in King street with the selfsame old oak presses and wonderfully carved chimney piece of Grinling Gibbons. Here are shelved books dealing with the history of the city; the books of Archbishop Mathew, and other notable gifts of books by Bristol citizens, amongst them being the Collectanea of Proverbs, Folklore, etc., collected by Mr. Vincent Stuckey Lean and presented to the city by his executors. This collection is made accessible by means of an exhaustive catalogue compiled under the direction of the city librarian of Bristol, Mr. E. R. Norris Mathews, F.R. Hist.S.F.R.S.L.; the early printed books and illuminated manuscripts being separately catalogued. The public library movement in Bristol has advanced with rapid strides from small beginnings. The system is extended by means of commodious branches to all parts of the city, nine branches serving respective wards and circulating 750,672 volumes in the course of a year, whilst the various newsrooms and reading-rooms are visited annually by a number of persons exceeding 2,500,000.

Art Galleries.— The Bristol Art Gallery was presented to the city by Sir William Henry Wills, now Lord Winterstoke. The building adjoins and communicates with the museum and was opened to the public in February 1905. Internally a large and lofty top-lighted central hall is surrounded by rooms on the ground floor devoted to the display of antiquities; a spacious marble staircase leads to picture galleries which form a splendid suite of communicating apartments.

Museum.— The Bristol Museum, originally a private proprietary institution, became the property of the citizens of Bristol in 1893. It is especially rich in objects illustrative of mineralogy, geology and palæontology; no less than 200 «types» and figured fossils are preserved here, described by such men as Agassiz, Riley, Stutchbury, Fitton, Huxley, Owen and many others. The zoological collections are likewise of importance.

Electric Lighting.— The Bristol Corporation is responsible for the electric lighting of the city. The first instalment of public street lighting in 1893 consisted of 96 lamps, the total number now is 677 arc lamps. For private lighting purposes the demand has reached the total of 185,897 lamps. The use made of electricity for power purposes is increasing rapidly. The electric tramways of Bristol are controlled by a private company. The overhead trolley system is in use, and a service of motor cars has recently been instituted to connect the sections, and to open up outlying districts.

Industries, Etc.— Bristol has long been famous for its glassworks, potteries, soapworks, tanneries, tobacco factories, chocolate factories, sugar refineries, shoe factories, copper, lead, iron and chemical works, as well as for ship-building and machinery yards. Coal is found and worked extensively within the limits of the borough. Bristol carries on an export and import trade with all parts of the world. Cereals and flour are the most important imports, others being oils, tallow, cheese, butter, bacon, cattle, sugar, timber, petroleum, hides. The total value of imports and exports in 1911 was $77,786,530 and $20,084,680, respectively. The total tonnage entered and cleared at Bristol in 1913 was 2,663,000. The present dock system comprises a dock of 19 acres at Avonmouth on the Gloucestershire bank of the Avon, and of 12 acres (deep water area) at Portishead on the Somerset bank of the river, two miles below Avonmouth; and a floating harbor of 70 acres in the heart of the city. The latest enterprise in dock construction is that of the Royal Edward Dock at Avonmouth which covers an area of 30 acres and provides accommodation for vessels much larger than any afloat. The first sod was cut on 5 March 1902; it was opened in 1908. The depth of water on the inner sill is at mean spring tides 40 feet and at mean neap tides 30 feet. The length of the dock is 1,120 feet and the width 1,000 feet. The entrance lock is 875 feet long and 100 feet wide. On each side are piers at which steamers land mails and passengers, who reach London over an almost straight line in two and a half hours. Bristol traders colonized Newfoundland and established commerce with the West Indies and the American colonies. The city has long been known for its ship building interests, and the *Great Western*, the first steamship to cross the Atlantic, was built at Bristol in 1838. A United States consul is stationed here.

Education.—The principal institution for the higher education is Bristol University, chartered in 1909, and possessing in 1913–14 150 teachers and 650 students, the nucleus of which is the University College, opened in 1876. The university claims the honor of being the first to open its doors to women students.

The Grammar School dates from pre-Reformation days. In 1532 it was endowed by Robert and Nicholas Thorne. The Cathedral School likewise dates back to the Reformation, it being part of the Cathedral Corporation established by Henry VIII in 1538. The City School, or Queen Elizabeth's Hospital for boys, was founded in 1586, and owes its existence to John Carr, a wealthy Bristol citizen. The Red Maids School for girls is the foundation of Alderman Whitson by bequest in 1627. The Clifton College, opened in 1862, has for many years ranked high as an English public school. The college buildings and grounds occupy a large area east of Clifton Downs. The Merchant Venturers' Technical College was originally a trade school. In 1875 the endowed schools' commissioners appointed the Society of Merchant Venturers as trustees. The building — a monument to the liberality of that Society — was almost totally destroyed by fire in October 1906, and is now in course of re-erection. Other educational establishments are: The Clifton and the Redland High Schools for girls; Clergy Daughters' School; about 45 Council schools directed by the education committee of the Bristol Corporation, inclusive of three higher grade and science schools; a day industrial school; a school for cookery; truant school, and an institution for the deaf and dumb. The Congregationalists erected in 1906 a commodious college building at Cotham for the training of students for the ministry.

Charity.—The charitable institutions of Bristol are so numerous and of such importance that adequate mention of them here is impossible. The invested funds devoted to charitable work yield a revenue exceeding $300,000 per annum, which sum supports almshouses, asylums, homes and schools, and provides for pensions and gifts of all descriptions. The name most familiar in a long list of benefactors is that of Edward Colston, whose name is handed down to successive generations by three great commemorative societies instituted to perpetuate his grand philanthropy. These societies are instrumental in raising funds by voluntary subscriptions amounting to upward of $15,000 per annum. The charities, formerly regulated by the Corporation, are now by decree of the charity commissioners administered by trustees. The Merchant Venturers' Society, which as early as the 7th year of Edward IV claimed to be an ancient guild, has endowed and supports others, whilst denominational bodies are mainly responsible for the remainder, one of the most remarkable being the Ashley Down Orphanages, founded in 1836 by the Rev. George Müller.

Government.—The city is governed by a council consisting of 22 aldermen and 66 councillors, the former being elected for a term of six years, and the latter for a term of three years, agreeably with the provisions of the Municipal Corporations Act. The mayoral list of Bristol extends in unbroken sequence from the year 1216, when «the King (Henry III) with his counsellors and tutors came to Bristol as to a safe place, at which time he permitted the town to choose a mayor after the manner of London.» In June 1899, or more than 600 years after the institution of the office, Queen Victoria was graciously pleased to direct that the mayor of the city of Bristol should in future bear the style and title of lord mayor.

History.— The Celtic name of Bristol was Caer Oder, or the City of the Chasm (namely, through which the Avon flows). The name Bristol is derived from the Anglo-Saxon bricg, a bridge, and stow, a place. It was early a place of commerce, and received its first charter from Henry II in 1172. Between 1239 and 1247 a new channel was dug from the Frome in order to provide better accommodation for shipping. In the reign of Edward II Bristol rebelled against the royal authority and was held by the citizens against the sovereign for four years. In 1373 it was constituted a county of itself, by Edward III. It was made the seat of a bishopric by Henry VIII in 1542. During the civil war between Charles I and the Parliament it declared in favor of the latter, but was stormed and taken by the Royalists under Prince Rupert. After the battle of Naseby it was taken by Fairfax, and its formidable castle was razed to the ground. In 1831 the Reform agitation gave origin to riots that lasted for several days. The rioters destroyed various public and private buildings, among which was the bishop's palace, and a number of them lost their lives. Bristol was united as a bishop's see to Gloucester in 1837. The first bishop of Bristol and Gloucester united was James Henry Monk, created in 1837. By the Bristol Bishopric Act Bristol was again separated from Gloucester and Dr. Forrest Browne was enthroned, 28 Oct. 1897. Sebastian Cabot, Chatterton, Southey and the painter Lawrence were natives of Bristol. The city returns four members to Parliament.

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E. R. NORRIS MATHEWS,
L. ACKLAND TAYLOR.

BRISTOL, N. H., town in Grafton County, 30 miles north from Concord. It is at the junction of the Pemigewasset and New Found rivers; is the terminus of the Bristol branch of the Boston & M. Railroad, and has become a place of summer resort. It has a public library and flannel, woolen and paper manufactories, pulp mills, grist mills and woodworking shops. There are a national and a savings bank and a town and union school district. The assessed property valuation is $1,000,000. The government is by selectmen. Receipts in 1915 amounted to $35,472; expenses to $33,266. Pop. 1,500.

BRISTOL, Pa., borough in Bucks County, on the Delaware River, the Pennsylvania Railroad and the Pennsylvania and Lehigh Canal, 21 miles northeast of Philadelphia. It has a national bank, high school, electric-light and street railroad plants and manufactories of carpets, hosiery, worsted, steel and leather goods, cast-iron pipe, wall-paper and foundry products. The United States census of manufactures for 1914 reported 32 industrial establishments of factory grade, employing 1,920 persons, of whom 1,809 were wage-earners, receiving annually $811,000 in wages. The capital invested aggregated $4,213,000 and the value of the year's output was $5,037,000; of this $900,000 was the value added by manufacture. It is in a rich fruit and truck farming region and is the centre of considerable trade. Bath Springs, famous in the 18th century and still frequented, are just outside the borough limits. It was originally called Buckingham and was settled in 1681 and incorporated in 1720. A ferry connects it with the town of Burlington on the New Jersey side of the Delaware. Under a charter revised in 1905, the burgess holds office for four years and appointments are made by the borough council. Pop. 10,000.

BRISTOL, R. I., town, port of entry and county-seat of Bristol County, on Narragansett Bay, the New York, N. H. & H. Railroad and the Providence & N. Y. steamship line, 15 miles southeast of Providence. It has an excellent harbor, facilitating a large daily passenger and freight service for Fall River and Providence. It is the seat of the widely-known Herreshoff ship-building works, where a number of noteworthy sailing and steam yachts and torpedo boats have been constructed, and also of the Saunders & West yacht-building works. The town has a handsome brown-stone library building containing some 15,000 volumes, eight churches, 17 public schools, large market gardening and coast trade interests and manufactories of rubber, woolen and cotton goods. A State soldiers' home and homes for aged men, old ladies and children are located here. Bristol is the site of the Narragansett village, Mount Hope, the residence of King Philip, the great Naragansett chief. It was first settled by the whites in 1680 and was incorporated as a town in 1746. In 1775 it was bombarded by the British, and was visited again by British troops and partially destroyed in 1778. Pop. (1920) 11,375. Consult Miller, W. J., 'Celebration of the Two-Hundredth Anniversary of the Settlement of the Town of Bristol' (Providence 1881); Munro, 'History of Bristol' (Providence 1880).

BRISTOL, Tenn. and Va., a city in Sullivan County, Tenn., and Washington County, Va., incorporated 1856. Its location on the State line, with the population being about equally divided between these two States, has necessitated two separate municipal governments, each conforming to the State constitution under which it exists. Otherwise Bristol is in reality one city. Bristol, Tenn., has the commission form of government. The city is a terminal point for five railroads, the connections forming trunk lines in three directions. These roads have brought Bristol in touch with the rich mineral and timber resources of that region, especially the iron and coal deposits. To develop these resources, Bristol has become the headquarters of a number of companies. Bristol has four banks, 45 wholesale mercantile houses, 47 manufacturing plants; its principal industries including iron, lumber, barytes, belting, leather, tanning extract, paper, pulp, flour, foundry and car shops and silax industry. Its business aggregates $16,000,000 annually. The United States census of manufactures for 1914 recorded 57 industrial establishments of factory grade for the combined city, employing 1,385 persons, of whom 1,129 were wage-earners, receiving $450,000 annually in wages. The capital invested aggregated $2,941,000 and the year's output was valued at $3,398,000; of this, $1,311,000 was the value added by manufacture. There are one weekly, one semi-weekly and one daily newspaper; two colleges for women, one for men and one for colored people. Its churches represent practically all denominations. Pop. (1920) 14,776.

BRISTOL, Vt., town in Addison County, 20 miles northeast of Middlebury, on the Bristol Railroad. It has manufactories of caskets, wood boxes and turned woodwork. The value of its taxable property is placed at $1,368,452. It contains a graded school. Holly Hall and a free public library. Pop. (1920) 4,251.

BRISTOL BAY, an arm of Bering Sea, lying immediately to the north of the peninsula of Alaska. It receives the waters of two large lakes, by which communication with the interior is opened up for a considerable distance.

BRISTOL BRICK, or **BATH BRICK**, a kind of brick used for cleaning steel, manufactured for some years exclusively in Bridgewater and Bristol, England. A small vein of the sand required for this purpose was found near Liverpool but was soon exhausted. One of the owners or operatives who had been concerned in the works at Bristol visited the United States in 1820, where by accident he discovered that the same kind of sand which was used for the Bristol bricks might be procured at South Hampton, N. H. Since that period bricks fully equal to the imported article have been manufactured in this country.

BRISTOL CHANNEL, an arm of the Irish Sea, extending between the southern shores of Wales and the western peninsula of England and terminating in the estuary of the Severn. It is about 90 miles long and from 5 to 50 miles wide, the greatest breadth being between Saint Gowan's Head and Hartland Point. It is remarkable for its high tides and the rapidity with which they rise. At Chepstow spring tides rise as high as 47 feet. It has an irregular coast of 220 miles on which are situated the towns of Cardiff, Swansea, Ilfracombe, Tenby, etc. It receives the waters of the Usk, Severn, Wye, Avon, Parrott, Taw and Torridge rivers. At the entrance of the channel is Lundy Island. Large ocean vessels can ascend the channel to the heart of the city of Bristol, which is nearer to London than either Liverpool or Southampton.

BRISTOL EARTHENWARE. Records show an active pottery existed at Bristol, England, late in the 13th century and another in the 16th century. The oldest known piece of Bristol pottery existing is dated 1703. Richard Frank ran a delft works, at Redcliffe Bank, till 1777, and Joseph Ring (from 1784) continued the factory till (early in the 19th century), Wedgwood ware killed the delft demand. By 1786 Ring had started making «cream color» or Queen's ware and other Staffordshire kinds. Joseph Flower started a delft factory in Frank's time. A very interesting feature concerning Bristol delft is that great quantities were shipped to America and the United States possesses most of the extant Bristol pieces, though many admiring owners do not know its origin. Common stone-ware was also made in Bristol.

Characteristics.— Flower's pieces are said to have better paste, glaze and color than those of Frank or Ring. Bristol blue is darker than most English wares. Bristol cream-color ware has «stronger yellow color» than the Staffordshire.

Product.— Plates, dishes, «Dutch» tiles for fireplaces and walls, teapots, punch-bowls, etc.

Decoration.— Blue-and-white decoration is usual. Simple patterns painted in white, more opaque than the greenish-blue surface white ground (bianco sopra bianco), on dish and plate borders was confined to Bristol ware in England. The pictures are usually «Chinese taste.» No transfer prints till 1797. Favored motifs were wreaths of flowers and leaves, Chinese pictures, landscapes, etc.

Glaze.— Specimens show an unpleasant «blue or blueish-green tone comparing unfavorably with true delft of good quality» and also «thicker, muddier and less brilliant» than Lambeth or Liverpool (Burton).

Paste.— Dark and coarse.

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BRISTOL PORCELAIN. Richard Champion, of Bristol, in 1770, was producing porcelain from «Cornish stone» under Cookworthy's (see PLYMOUTH) patent in the firm name of Cookworthy & Co. He purchased the patent outright in 1773. The patent expiring, he obtained an extension (after Wedgwood's contest in Parliament), but Cookworthy's aims at art products were too ambitious for financial success. He sold out to a factory at New Hall, Staffordshire.

Characteristics.— Bristol style tended toward Meissen (Dresden) ideals, whereas Plymouth leaned to Oriental taste. Biscuit almost equal to Derby (see DERBY). Figures are «thickset, lack grace, coloring poor» (Binns). Forms often warped in oven.

Product.— Tea, coffee and dessert services, figures, bouquets of flowers after Vincennes style, «cottage ornaments,» vases, candlesticks. Champion's *biscuit* (unglazed) plaques were delicate and beautiful; decorated often with coats-of-arms and wreaths of flowers (Adams style) carefully molded in green shaded with brown and black and attached (sprigged). The figures of Franklin (his friend) and Washington appear on larger plaques.

Decoration.— Colors used were blue, green, lilac and red mostly; ground colors (rare) yellow and green. No underglaze colors. Motifs were wreaths (see above), «exotic birds» sprays of flowers in medallions.

Glaze.— Good and evenly distributed, but has minute holes and black specks (defects of firing). Glaze shows a «cold, white glitter.»

Paste.— Soft paste was used till 1770 (of *unaker*, American clay) in experiments, then hard paste. Surface shows spiral ridges (termed often «whorls»). Bristol cups and saucers very translucent, with yellowish tinge when held up to the light. Consult Compton, F., 'William Cookworthy' (London 1895); Trapnell, A., 'Catalogue of British Porcelain' (Bristol 1898).

Marks.— Tin enamel (delft) plates have, sometimes, E above MB and 1760 below it. Ring's cream-color has a mark E R with 1786 beneath, at times. Another mark is «BRISTOL» on a band with two crossed palm leaves above and scroll-work beneath. When Champion used the Dresden «cross-swords» mark (always under glaze) he added some sign, as a dot or something between the hilts and a number beneath, and overglaze + sign on this mark. Early (soft paste) experimental pieces are marked «Bristoll» impressed (rare). From 1770 a + was the mark or a letter B. Early pieces show the Cookworthy (Plymouth) alchemists' tin symbol with a cross.

CLEMENT W. COUMBE.

BRISTOW, Benjamin Helm, American lawyer: b. Elkton, Ky., 20 June 1832; d. 22 June 1896. He was graduated from Jefferson College, Pa., in 1851 and was admitted to the bar in Kentucky in 1853. He served with distinction in the Civil War, reaching the rank of colonel, and at its close was appointed United States district attorney of Kentucky. In 1874 he became Secretary of the Treasury and made his name memorable by the exposure and prosecution of a notorious whisky ring. He removed to New York in 1876 and had an extensive legal practice there. Consult Wilcox, D., 'Memorial of Benjamin Helm Bristow' (Cambridge 1897).

BRISTOW, Joseph Little, American politican: b. Flemingsburg, Ky., 1859. He was educated for the ministry, but became editor of the Salina, Kan., *Republican,* and soon after entered politics. He was secretary of the Republican State Committee in 1896, and in 1898 was appointed fourth assistant Postmaster-General. In 1900 he became active in exposing frauds in the Post Office Department and reorganized the Cuban postal service. President Roosevelt appointed him special commissioner of the Panama Railroad in 1905. He was elected to the United States Senate in 1909 and in 1912 was an active supporter of the Roosevelt Progressive Party. He served on many important committees of the Senate. In 1915 he was elected chairman of the Kansas Utilities Commission for a term of three years.

BRISTOW, Okla., city in Creek County, on the Saint Louis and San Francisco Railroad. It contains cotton gins, cotton-oil mills, oil refineries, glass works and lightning and oil tank protectors. It has four banks with total resources amounting to $1,800,000, and an assessed property valuation of $1,056,000. It has also two graded schools and a high school, a city hall and masonic temple. The municipal revenues amount annually to about $18,000. The government is vested in a board of aldermen. The city has an ample supply of pure water and has also extensive agricultural interests. A large gas field nearby furnishes an ample supply of cheap fuel. Pop. 3,500.

BRISTOW STATION, now **BRISTOE,** Va., a village in Prince William County, four miles southwest of Manassas Junction on the Southern Railway. On 27 Aug. 1862 a drawn battle took place here between the Federal army under General Hooker, and a Confederate one under General Early and on 14 Oct. 1863, the Federal troops under General Warren repulsed with severe loss a Confederate attack under Gen. A. P. Hill.

BRITAIN. See GREAT BRITAIN.

BRITAIN, Ecclesiastical History of, by the Venerable Bede, or Bæda (673–735). A history of England from the earliest Roman occupation to 731 A.D. The sources were Roman writers, native chronicles and biographies, public records and documents, and oral and written contemporary accounts. It was written in Latin; first printed at Strassburg about 1473; King Alfred translated it into Anglo-Saxon; and it has had several editions and English versions in recent times. For bibliography see BEDE.

BRITAIN, New. See NEW POMERANIA.

BRITANNIA, the ancient name of Britain. Under the name of Britannia, Great Britain is personified as a helmeted woman seated on a globe or an insulated rock, leaning with one arm on a shield, and the other grasping a spear or trident.

BRITANNIA METAL, an alloy that has come into very general use in modern times, many domestic utensils, such as spoons and teapots, being made of it. Such articles are commonly electro-plated, and made to resemble real silver. It consists chiefly of tin and antimony, but often contains also a small quantity of copper zinc and bismuth. A common proportion is 140 parts of tin, 3 of copper, and 9 of antimony; but the best alloy is composed of 90 parts of tin and 10 of antimony. The copper is used mainly to impart color to the combination. The manufacture of the metal was introduced into England about 1770. Queen's metal is one of the varieties of Britannia metal.

BRITANNIA TUBULAR BRIDGE, an iron tubular bridge across Menai Strait, which separates Anglesea from Wales, about one mile from the Menai suspension bridge. It has two principal spans of 460 feet each over the water, and two smaller ones of 230 feet each over the land; constructed 1846–50. See BRIDGE.

BRITANNICUS, the son of the Roman Emperor, Claudius, by Messalina: b. about 42 A.D.; poisoned 55 A.D. He was passed over by his father for the son of his new wife Agrippina. This son became the Emperor Nero, whose fears that he might be displaced by the natural successor of the late Emperor caused him to murder Britannicus.

BRITH ABRAHAM, Independent Order, a Hebrew mutual benefit fraternity society, the largest and foremost Jewish order in the United States, with headquarters in New York city. The society was founded in 1887 as an offshoot of the Order Brith Abraham, founded in 1859. In the pursuit of charity, fraternity and other noble aims, a splendid spirit of unity and harmony, support and co-operation, has been shown by officers and members in all matters involving the welfare of the order. Democratic principles promoting the general interests of the institution, inaugurated by the administration, under the leadership of untiring champions of American Judaism, have actuated its movements and enterprises, and the formation and development of its cultural and humanitarian institutions. The lodges not only offer pecuniary benefits, advantageous rates of insurance, etc., and serve as social centres, but they have also contributed largely to the machinery for national Jewish organization throughout the United States, to combat all anti-Semitic projects. In 1915 there were 759 lodges and 17 separate ladies' lodges in the United States; 26 new lodges were instituted. The total number of members was 200,142, of which 104,173 were males, 95,969 females. The number of deaths was 1,502; $42,049 were disbursed in charity; $13,875 in disability cases; $743,890 in death benefits; covered by endowments, reserves funds and other receipts. The order and lodges also contributed liberally to the relief movement started in the United States for the benefit of the stricken Jews in the countries devastated by the great European War.

BRITISH AMERICA, the general name for the whole northern part of the North American continent beyond the territory of the United States extending from lat. 41° to 78° N., and from long. 52° to 141° W. The frontier line between British America and the United States was determined by the conventions of 1839 and 1846. It is bounded east by the Atlantic Ocean, Davis Strait and Baffin Bay; north by the Arctic Ocean; northwest by Alaska; west by the Pacific Ocean; and south by the United States. In its broadest sense British America includes all the Canadian provinces, the Hudson Bay and Northwestern territories, Nova Scotia, Newfoundland, Cape Breton, Prince Edward Island and New Brunswick, with Vancouver Island in the Pacific, and all British possessions on or near the American continent. Each of these is treated under its own title.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, a society first organized in 1831, mainly through the exertions of Sir David Brewster. Its first meeting was held at York, 27 Sept. 1831. Its objects described in the preamble to the rules of the Association are: "To give a stronger impulse and a more systematic direction to scientific inquiry; to promote the intercourse of those who cultivate science in different parts of the British empire with one another and with foreign philosophers; to obtain a more general attention to the objects of science and a removal of any disadvantages of a public kind which impede its progress." The second meeting took place at Oxford in 1832, under the presidency of Dr. Buckland, and since then a meeting has been held every year up to the present. All the principal towns of the United Kingdom have on one or more occasions formed the place of rendezvous, a different locality being chosen every year. In 1884 the meeting took place at Montreal, in 1897 at Toronto, and in 1902 the 72d annual meeting was held in Belfast, Ireland. It has also met in Winnipeg, and once in South Africa where the session was divided between Cape Town and Kimberley. It also met in 1914 in Australia, where a five weeks' visit, the beginning of which was coincident with the outbreak of the European War, included in its itinerary Perth, Adelaide, Melbourne, Sydney and Brisbane. In 1916, the Association met at Newcastle under the presidency of Sir Arthur Evans. The sittings extend generally over about a week. The Society is divided into sections, which, after the president's address, meet separately during the sittings for the reading of papers and conference. Soirées, conversaziones, lectures and other general meetings are usually held each evening during the meeting of the Association. The sections are: A. Mathematics and Physics; B. Chemistry; C. Geology; D. Zoology; E. Geography; F. Economic Science and Statistics; G. Mechanical Science; H. Anthropology; I. Physiology; K. Botany; and L. Educational Science. Local committees are formed to arrange for meetings, etc. The important national benefits conferred by the labors of various members of the Association have long been duly recognized. Among these may be mentioned more especially the experiments on electricity and magnetism which have achieved such important consequences in the establishment of the electric telegraph and a more thorough knowledge of the laws which govern the weather and other meteorological phenomena. In mechanical science also the labors of members of the British Association have been productive of the most important results. As the funds which the Society collects at each meeting are more than sufficient to cover its expenses, it is enabled each year to make direct grants for the pursuits of particular scientific inquiries, which otherwise could not be conducted so efficiently, if at all; but besides this direct encouragement, its indirect influence on the promotion of science is undoubtedly great in many ways. Among the presidents of the Association have been many distinguished men, including Dr. Whewell (1841), the Earl of Rosse (1843), Sir John Herschel (1845), Sir R. Murchison (1846), Sir David Brewster (1850), Sir George Airy (1851), Sir Richard Owen (1858), Prince Consort (1859), Lord Armstrong (1863), Sir Charles Lyell (1864), Sir J. D. Hooker (1868), T. H. Huxley (1870), Lord Kelvin (1871), J. Tyndall (1874), Sir John Lubbock (1881), Lord Rayleigh (1884), Lord Playfair (1885), Sir William Huggins (1891), Sir. A. Geikie (1892) and Sir. W. Crookes (1898).

BRITISH CENTRAL AFRICA. Name changed in 1907 to NYASALAND PROTECTORATE (q.v.).

BRITISH COLUMBIA, the most westerly province of the Dominion of Canada, lies on the Pacific Ocean, and has a series of coastline fiords or passages unexcelled on any shore in the world. The province extends from south to north from lat. 49° N. to lat. 60° N. Its eastern boundary follows the crest of the Rocky Mountains as far as 55° N. and then follows long. 120° W. up to lat. 60° N. British Columbia has a total land area of 355,855 square miles, almost exactly three times the extent of the British Isles. There are in addition 16 inland lakes with an area of 2,439 square miles. It is the third province of Canada in size.

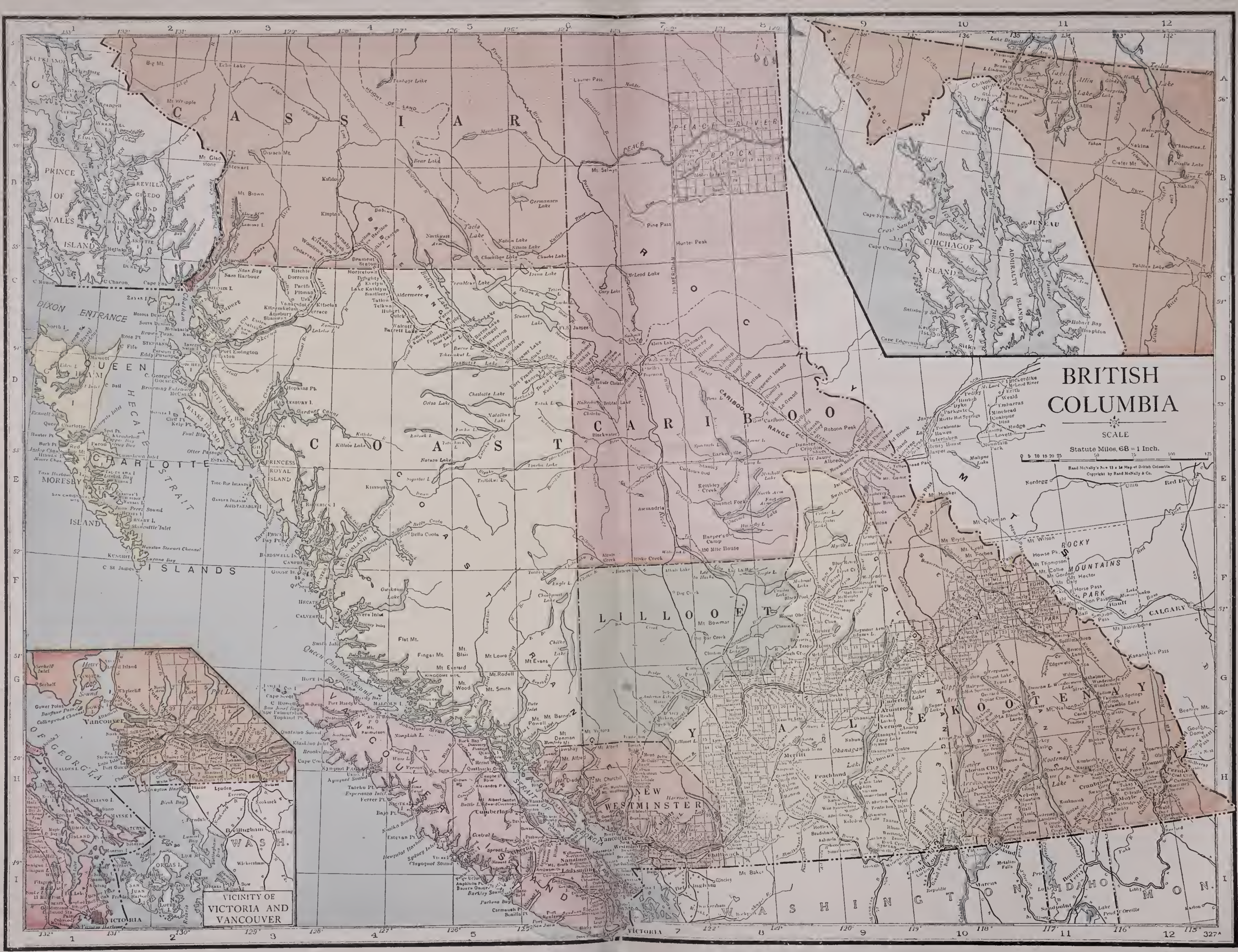
Climate.— The climate of British Columbia is varied. The Japan current on the Pacific Ocean acts in the same way as the Gulf Stream on the Atlantic, and on the coast region makes a mild though at certain seasons a very wet climate. But the damp breezes from the Pacific Ocean having deposited their moisture on the west slope of the Coast Range pass over eastward as dry Chinook winds, so that 150 miles from the coast are found the Okanagan and Thompson River valleys where irrigation is required. As water is plentiful on the mountain slopes, fruit growing is carried on successfully in this irrigated region. Every variety of climate is thus obtainable in British Columbia, from the humid flats of the Pacific islands and coast mainland to the dry plains of the interior, and then to the icy cold and perpetual snow of the Rocky Mountain slopes. The valleys thus grow cereals in some parts, on the lower lands luxuriant grasses, and fruit of every kind in many places. The climate of Vancouver Island and the mainland coast is dry in summer, somewhat rainy in winter, but never hot nor extremely cold. This region is a favorite resort for people from the prairie country seeking a more balmy climate.

Physical Geography and Mining.— The greater part of British Columbia is made up of mountains, elevated plateaus and valleys — including the Rockies and Selkirks on the east and the Coast and Island ranges on the west, with an average height of about 8,000 feet. To the west of the great ranges there is a wide and elevated plateau in which is to be found extensive agricultural areas. From and through these great mountains run several large rivers — the Columbia, the Fraser, the Skeena, the Stikine, the Liard, the Peace and their tributaries. Naturally the initial resources and development of such a region would be minerals, timber, fish and similar products. The total mineral products of the province up to and including 1916 has been $559,000,000. The first gold production was in the placer-mining period from 1862 onward, when the banks of the «golden» Fraser and other creeks or rivers yielded some $50,000,000. Then commenced (about 1895) the serious lode mining which is now running into $5,000,000 yearly. The total production of placer and lode gold up to the end of 1916 was $165,500,000; that of silver, $441,400,000; of lead, $36,000,000; of copper, $115,200,000; of coal and coke, $166,500,000; of zinc, $6,800,000; besides lime, building stone, brick, etc. The total production of the mines in 1895 was $1,266,954; in 1900 it was $4,732,105; in 1911 it was $23,499,072, in 1916 $43,000,000.

The country is divided into districts. Kootenay has an area of 17,000,000 acres and contains a large amount of agricultural land, some of it requiring irrigation. The name is synonymous with the idea of mineral wealth and its mountains are rich in gold, silver, coal, lead, copper and zinc. In the last 20 years a number of towns have grown up around and in connection with these mines — Revelstoke, Nelson, Kaslo, Rossland, Traill, New Denver, Sandon, Slocan City, Fernie, Cranbrook, Golden, etc. Yale has about the same area and includes the rich valleys of the Okanagan, the Nicola, the Similkameen and the Kettle River country. It has large cattle ranges and fruit farms as well as the Boundary mineral region. Lillooet contains some 10,000,000 acres, is bisected by the Fraser River and well adapted for cattle raising and dairying. Big game is common and there is still some placer mining. Westminster is about half the size of Lillooet and includes the Fraser River Valley, which has one of the largest compact areas of agricultural land in the province. Lumbering is an important industry and salmon-canning its best known business. Cariboo was the centre of the great placer mining excitement of the sixties, when so much gold was taken out of its creeks. Hydraulic mining is now conducted on a considerable scale. Cassiar is largely unexplored. There have been gold discoveries in Omenica, in the vicinity of Dease Lake, in the Atlin country and Skeena.

Comox includes the northern part of Vancouver Island and contains one of the chief logging camps of the province. It is rich in timbers, fish, minerals and agricultural land, though as yet very sparsely populated. This latter description, outside of Victoria and its vicinity, will apply to the whole of Vancouver Island. The gross output of provincial collieries in 1916 was 2,500,000 tons.

There are vast areas of coal in the Ground Hog district in the northern part of the prov-



BRITISH COLUMBIA

SCALE

Statute Miles, 68 = 1 Inch.

Rand McNally's New 12 x 14 Map of British Columbia
Copyright by Rand McNally & Co.

ince, at present not accessible for want of railway communication. Large areas of low grade gold gravels are found in the Cariboo district awaiting some cheap method of hydraulic mining. There are large deposits of zinc in the Slocan district associated with lead and silver. This was formerly regarded as a nuisance by the silver lead smelters. European War prices, with better methods of separation and refining, have made these resources valuable. The operators are now working over the dumps where zinc blende was formerly thrown away. Every zinc prospect in the Kootenay is now worked to its full capacity. The value of zinc produced in 1915 was $6,000,000; in 1916 nearly $7,000,000. Iron ore is found distributed over the province with large deposits on Texada Island, from which small quantities of ore have been taken for export. In 1917 it was expected that active measures would be taken for the further exploration and development of these resources. The output of metalliferous mining in 1916 was over $32,000,000, an increase of 54 per cent over the previous year. While this increase is partly due to higher prices there was a gain in quantities of lead, copper and zinc. It is estimated that the value of the mineral product for 1917 will exceed $50,000,000.

Lumber.— The timber resources of British Columbia are enormous. With 50,000,000 acres, containing 400,000,000,000 foot board measurement, the province has more saw timber than any other in the Dominion. The chief commercial woods in the order of importance are Douglas fir, red cedar, spruce, yellow pine, western larch, western hemlock, but maple, oak, alder and other woods of less commercial value abound. The total value of forest products in 1916 was $35,528,000, an increase of $6,000,000 over the previous year. This included lumber to the value of $21,000,000; pulp $3,500,000; shingles $4,500,000; boxes $1,800,000. More than two-thirds of the lumber cut of 1,280,000,000 feet was Douglas fir which is not found elsewhere in Canada. This remarkable wood, produced from the largest trees in the Dominion, makes the finest structural timber obtained in America. It is equal in quality for building purposes to the Southern or Georgia pine, and can be obtained in much larger sizes. This makes it useful for building wharves and trestles. Squared sticks 70 to 100 feet long and 3 to 4 feet in section are shipped. The province has a considerable export trade in lumber under normal conditions, and efforts are now made to introduce this product to markets not yet reached. At present the chief market for boards outside of the province is in the Prairie provinces of Alberta, Saskatchewan and Manitoba, though there is a considerable trade in shingles with the United States. Most of the Douglas fir is grown in the Coast district and the islands. The logs are brought to the sea board or the rivers, and rafted to mills on the coast and inlets. Some of the principal saw-mills are at the mouth of the Fraser River, and one of these claims to be the largest in the world. There are saw-mills also in the interior, on the western slope of the Rocky Mountains, where lumber, chiefly spruce, is manufactured for the Prairie market. Pulp and paper mills have been established at Powell River and elsewhere, and this industry is becoming one of the most important in the province.

Fisheries.— British Columbia has for some years led all the other provinces of the Dominion in the value of its fishery products, and in the fiscal year ending March 1916 yielded 40 per cent of the Canadian total. The value of fish produced in the province in 1916 was $14,538,000; of chief importance among these fish is the salmon. In 1916 the salmon catch was valued at $10,700,000. This included 350,000 hundredweight of fish sold fresh, valued at $2,422,000; and 1,133,381 cases of canned salmon of the value of $7,933,667. There are several kinds of salmon, of which the one known as the «sockeye» is preferred for canning, while the «spring salmon» is considered the best fresh table fish. Great Britain is the largest market for canned fish, but they are shipped to many countries. Second in importance is the halibut. It was valued in 1916 at $1,972,000; herring, cod, oulachons, clams, sturgeon are also produced in merchantable quantities. Whale fisheries are prosecuted with some success. The seal industry has been discouraged by international arrangements.

Agriculture.— While a large part of the province is unsuitable for farming, there are fertile valleys and plains, and in the north a considerable area of prairie east of the Rocky Mountains. The Okanagan Valley, the Thompson Valley and much of the coast country is suitable for fruit growing, and British Columbia fruit has acquired a considerable reputation abroad. The delta of the Fraser is exceedingly rich, producing phenomenal crops of fruits, hay and cereals. It is no uncommon thing to harvest over 100 bushels of oats to the acre on these lands, while 20 tons of potatoes is not regarded as an extraordinary crop. The valleys are well adapted to dairy farming, and the Ashcroft district is renowned for the quality of its potatoes. The Peace River district, which is yet mostly unsettled awaiting railway extension, is a prairie country suitable for wheat growing. The total value of farm products in 1916 was computed to be $32,000,000.

Industrial.— British Columbia cannot be considered as yet a manufacturing province except in special industries such as lumbering, mentioned above, fish canning, the smelting of metals, the manufacture of pulp and paper, and of late, shipbuilding. In 1917 there were under construction or contract at Vancouver, Victoria and their neighborhoods 10 or 12 steel ships and at least 20 wooden ships. The latter are mostly auxiliary sail and power vessels.

Commerce and Transportation.— For the year ending March 1914, the imports through the ports of British Columbia were valued at $58,000,000; exports $34,000,000. The trade fell off during 1915 by reason of the war and other causes to $36,000,000 imports and $34,000,000 exports. For the fiscal year 1916 it is considerably larger, but the returns are not available. In proportion to population, British Columbia has in existence and under construction more railway mileage than any other province, and perhaps more than any other country in the world. This is partly due to the fact that it is on the transcontinental highway, and partly also to the, perhaps excessive, ambition of its people and government to open up the country for settlement as rapidly as possible. Three transcontinental lines, the Canadian Pacific, the Canadian Northern and the Grand

Trunk Pacific, pass through the province, the latter with its terminal at Prince Rupert in the north, the other two reaching the ocean at Vancouver, and the Canadian Northern having extensions on Vancouver Island. The Canadian Pacific has branches along several of the valleys, a second main line through the Rocky Mountains, into the Kootenay country, a system of Railways on Vancouver Island, extensions into the United States, lines of boats on the Okanagan lakes, the Kootenay lakes and on the coast, as well as between Vancouver and Victoria, with ocean lines to Asia. These main lines of course run east and west. Another important railway, the Pacific Great Eastern, under construction and near completion, runs north and south connecting the port of Vancouver with the Grand Trunk Pacific and is expected to extend into the Peace River country, farther north and east. The Great Northern Railway of the United States has extensions to Vancouver, where in 1917 extensive terminals were in preparation. In 1907 the railway mileage in the province was 1,686. In 1915 it was 3,100, in 1917, about 3,600, with at least 500 miles under construction. The province has guaranteed the principal and interest of bonds to the extent of some $50,000,000 for the Canadian Northern and Pacific Great Eastern railways. The British Columbia Electric Railway system includes street lines in Vancouver and Victoria with suburban extensions and a line from Vancouver through to New Westminister, to Chilliwack on the Fraser River, the whole including 225 miles of track.

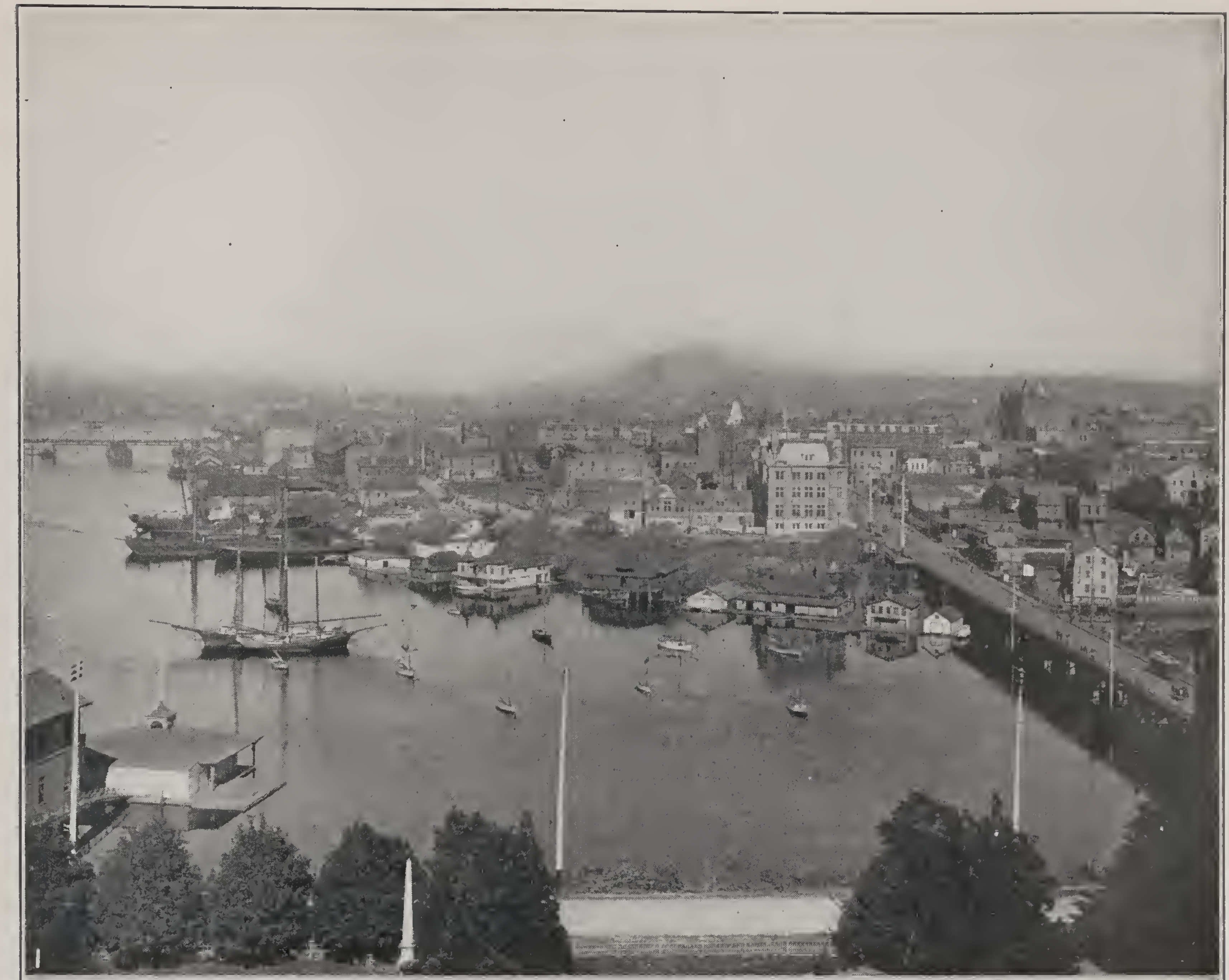
Finance.— The estimated provincial revenue for the year 1917–18 is $9,868,325; and the estimated expenditure $10,800,804, including in the latter case $2,032,225, charged to capital. The chief sources of revenue are Dominion subsidies $623,000; timber licenses, royalty and leases $2,300,000; taxes on real and personal property $3,000,000; income tax $1,090,000; succession duty $400,000; with numerous fees, etc. The real estate income and property tax was largely increased in the budget of 1917, and the expenditures reduced. In the previous two years there were large deficits. The expenditures include interest on the debt, the cost of civil government, administration of justice, with an expenditure of $150,000 for agriculture, and $1,800,000 for public works. The debt of the province in 1916 was computed to be $15,000,000, which is largely represented by roads and bridges constructed through this mountainous country. There were certain assessments in the form of uncollected royalties, taxes and amounts due for lands. Besides the above indebtedness there was a contingent liability on railway guarantees.

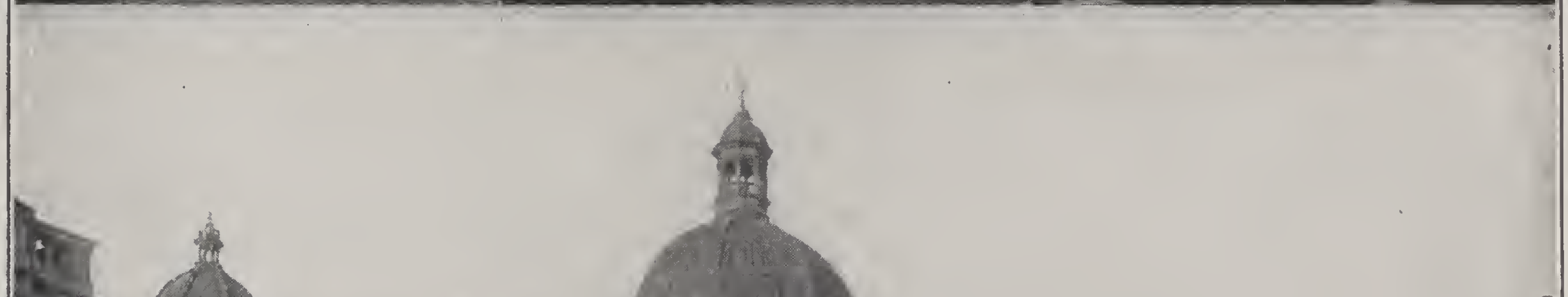
Population.— The population of British Columbia was in 1871, 36,247; 1881, 49,459; 1891, 98,173; 1901, 178,657; 1911, 392,480. In 1911 there were 251,619 males and 140,861 females. Of the male population in 1911, 68,963 over 21 years of age were foreign born. Of these 12,188 were naturalized and 56,755 alien. By origin 133,186 were English; 40,642 Irish; 74,493 Scottish; 8,907 French; 11,880 German; 7,015 Austro-Hungarian; 15,968 Scandinavian; 6,896 Russian; 9,721 Italian; 20,134 native Indian. The Oriental population included 19,568 Chinese, 8,587 Japanese and 2,292 Hindus. Of the total population in 1911, 170,000 were born in Canada; 107,000 in the British Isles; 125,000 in foreign countries, including 40,000 born on the European continent and 38,000 in the United States. Of the foreign-born Europeans, Austria-Hungary contributed over 6,000, Italy over 8,000, Scandinavian countries, nearly 11,000. Classified by religions, 101,000 were Anglicans, 82,000 Presbyterians, 58,000 Roman Catholics, 52,000 Methodists, 19,000 Lutherans, 17,000 Baptists, 3,600 Greek Church; while 26,000 are recorded as of Eastern religions, that is, Buddhists, Mohammedans, Hindus, etc. The population was more than half urban, viz., 203,687 urban to 188,796 rural. The chief cities are: Vancouver, population (1911) 100,401, the fourth city in Canada; Victoria, the capital, 31,600; New Westminster, the former capital, 13,199; Nelson, 4,476; and Prince Rupert (which commenced its existence in 1911), about 10,000.

Educational.— The educational system and methods of British Columbia are quite ambitious. The provincial treasury in various ways contributes $2,000,000 a year, or $5 per head, toward public education. The University of British Columbia, situated near Vancouver, has faculties in arts, applied science and agriculture. There are two normal schools and 30 high schools, with night schools for technical instruction. The system is non-sectarian, with English as the only language of instruction. The law provides for compulsory attendance. There are 419 schools and colleges altogether, the total enrollment during 1916 being 64,570 pupils, of whom 31,523 were in graded city schools, 15,350 in rural municipality schools and 12,927 in rural and assisted schools. The total number of teachers employed was 2,064, of whom 162 were in high schools, 845 in city graded schools, 499 in rural municipality schools and 558 in the rural and assisted schools.

Government.—The administration is vested in a lieutenant-governor, and a cabinet, comprising the Premier and seven heads of departments, with two or three other members of the executive. The heads are Minister of Finance, Attorney-General, Provincial Secretary, who is also Minister of Education, Ministers of Lands, Mines, Public Works and Agriculture. There is a single chamber legislature of 47 members, elected by manhood and womanhood suffrage. Women were admitted to full citizenship in 1917, after a popular referendum. Justice is administered by a Court of Appeal, composed of a chief justice and four other judges; the Supreme Court, comprising a chief justice and five others, 10 County Courts, each with one judge, except that of Vancouver which has three. There are also minor courts and juvenile courts.

Early History and the Hudson's Bay Company.— When Sir Francis Drake sailed up and down the Pacific coast of North America in 1578–79 and took possession of what is now the State of California, in the name of Queen Elizabeth, he is said to have sailed as far north as the entrance of the Strait of Juan de Fuca. In 1592 the Spaniard whose name is borne by those straits entered them and sailed a good distance up the Strait of Georgia, be-





1 City of Victoria from Parliament Buildings

2 House of Parliament

tween Vancouver Island and the mainland of British Columbia. Juan Perez, another Spaniard, in 1774 and Behring, the Danish navigator, in 1748, touched at points of this territory. But it remained for Captain Cook in 1778, under instructions from the British government, to really explore its coast and give names to places since well known to history.

Other explorers followed — Hanna, Meares, Portlock, Dixon, Haro, Duncan and Barkley — until in 1792 Cap. George Vancouver came with instructions to carry out a thorough survey of the intricate coast lines of the future province. After this period, for many years, Great Britain ceased to show any interest in the country. To the aggressive, enterprising traders of the Hudson's Bay Company was due the fact that the British flag was kept flying at all and that it was not eventually replaced by that of the United States, as in Oregon and Washington. In this connection the arrival of the company's steamer *Beaver* by way of Cape Horn, in 1835, marked an important era in the history of the province. Of the overland explorers the chief were Sir Alexander Mackenzie, 1793, Lewis and Clark, 1804–06, Thompson in 1807, Simon Fraser in 1808, the Astor expedition of 1810–11. From this time until the middle of the 19th century the history of what was then called New Caledonia is a record of Hudson's Bay fur-trading, occasional international or inter-company disputes, the building of dozens of forts, the maintenance of law and order amongst the Indians. Exclusive trading privileges were given the company in 1838, Alaska was leased by it in 1839, the Oregon boundary was fixed in 1846, and Vancouver Island was ceded in 1848 for a brief period.

Gold Discoveries and Early Constitutional History.— In 1858 a rumor reached San Francisco that gold had been found in the Fraser River. A party left at once for that region and the result of their success was a stampede from the Pacific coast city to the golden banks of the Fraser. The Horsefly discoveries and the rich bars of the Quesnelle were the next attractions. In 1861, the celebrated Williams' Creek was found and turned out to be one of the richest discoveries of the kind in history. Many claims paid dividends of from $20,000 to $60,000 a year, and all its diggings paid well. One claim of 300 feet of ground produced $300,000. For a time the placer mines of Cariboo repeated the history of California in 1849, and then came a gradual exhaustion, not, however, before some $50,000,000 worth of gold had been extracted.

Meanwhile, and up to 1849, the government of Vancouver's Island and the mainland of New Caledonia had been that of the great fur-trading company under its royal charter of 1670. In 1849, however, special terms were made with the company as to Vancouver Island and it was declared a Crown colony. A governor was appointed with a council of seven members and with authority to call an assembly elected by the inhabitants. This legislature, which first met in 1856, had full power to impose taxes and regulate affairs subject to and with the final assent of the governor. Mr. R. Blanshard was the first holder of this post, but from 1851 to 1856 the practical ruler of the country was Mr. (afterward Sir) James Douglas, a man of remarkable character and capacity, and who combined in himself the functions of chief factor of the Hudson's Bay Company with those of acting — and from 1856 to 1864 actual — representative of the Crown. On 17 Nov. 1866 the mainland, which was now known as British Columbia and had been under separate government since 1858, was united with Vancouver Island. The first legislature of the united province met in Victoria in 1868, though, as yet, it was only partially elective in composition.

Confederation with Canada.— During this period the British colonies on the Atlantic and on the great lakes of British America had combined in 1867, after prolonged agitation, in a confederated system. Ambitious extension had brought them by purchase in 1869–70, the rights and territory of the Hudson's Bay Company in Rupert's Land and the western prairies. Further and greater ambition was expressed in current expectation of a transcontinental line to the Pacific coast. At this point British Columbia came into consideration. Isolated behind an apparently insuperable barrier of great mountain ranges and with vast plains stretching for 800 miles between those mountains and the outposts of Canadian civilization, union was a dream without the prospect of a railway. With it the subject became practicable.

After much discussion of the subject throughout the province, the passing of resolutions by the provincial legislature and prolonged consideration at Ottawa, the terms of union agreed upon included six members in the House of Commons and three in the Senate; construction, to be commenced by the Dominion within two years, of a railway connecting eastern Canada with the Pacific coast; a land grant from the province to the Dominion government through the entire extent of British Columbia for the railway and not to exceed 20 miles on either side of the line; payment in return of $100,000 per annum to the province for the use of these lands; assumption by the Dominion of the charge of the Indians and their lands; complete responsible government and an entirely elective assembly to be established in the province whenever desired by the people. In November 1870 a provincial election was held and the terms of union approved. The new legislature met on 5 Jan. 1871, the proposals were unanimously ratified and, on 20 Jan. 1872, British Columbia entered confederation. The constitution was then reorganized upon a popular basis and in 1871 the elections under the new system took place.

Later Political Events.— Hon. J. W. Trutch was appointed the first lieutenant-governor and Hon. J. F. McCreight the first Premier. Succeeding prime ministers were Amor de Cosmos, G. A. Walkem, A. C. Elliott, J. Walkem, Robert Beaven, Wm. Smythe, A. E. B. Davie, John Robson, Theodore Davie, J. H. Turner, C. A. Semlin, Joseph Martin, James Dunsmuir, E. G. Prior, Richard McBride, Sen. W. J. Bowser and H. C. Brewster. Following the entry into confederation came prolonged and at one time acute differences with the Ottawa government over the non-completion of the Canadian Pacific Railway.

For some eight years, while that great undertaking was in the struggling stages of inception and preliminary construction, the discontent in the province was very great.

Meantime, however, construction went on slowly and surveys continuously. The imperial authorities were appealed to and missions came from eastern Canada and others went to London. Finally, Lord Carnarvon, as Colonial Secretary, suggested terms of settlement which were agreed to by both parties and which involved the construction and completion of the Canadian Pacific Railway by 1 Jan. 1891. It was completed in 1885. A visit of Lord Dufferin, as governor-general, to the coast in 1876 had, meantime, done much to smooth asperities and promote the settlement of this vexed and vital question.

Beyond the ordinary domestic questions, the chief political and social problem of British Columbia at the beginning of the 20th century was that of Oriental immigration. Of the 39,000 Asiatics in Canada in 1911, over 30,000 were in British Columbia, and this number was nearly doubled in the next four years. Most of these immigrants are men of working age, so that they would be approximately one-third of the male working people. Chinese were at first admitted free by Canada. In consequence of local protest a head tax on immigrants was imposed, beginning at $100 and increased to $500. This did not diminish the movement, for in 1913, Chinese immigration was 7,455, but in 1915 it was stopped altogether. Incidentally this deprived the province of a revenue of $1,750,000; since one-half of the tax was paid by the Dominion to the provincial treasurer. By the treaty between Great Britain and Japan, the Japanese were permitted to settle in British countries. Canada had the right to say that this agreement would not be applicable to the Dominion, but the Dominion government assented to the treaty. In 1907 Japanese arrived in large numbers; there was a strong protest in Vancouver city where a small riot occurred and damage was done to Japanese property. Afterward compensation was paid and the Canadian government entered into an arrangement with Japan under which the Japanese authorities refused permission for more than a limited number of Japanese to emigrate to Canada. A little later a considerable Hindu movement into British Columbia took place. This has been checked by regulations requiring direct sailing from India. In 1914 there was some trouble over the arrival of a shipload of Hindus arriving in violation of this arrangement, and they were returned in the same ship to India. The second decade of the century witnessed in British Columbia, as well as elsewhere in Canada, a period of eager and rapid railway construction, of speculation in real estate and of material development of many kinds. Land prices advanced rapidly, especially in cities and townsites along the lines of new and proposed railways. Reaction followed, with a drop of prices and a period of financial stringency, from which in 1917 the province was rapidly recovering. At the beginning of the war in 1914 the people of British Columbia responded quickly to the call for volunteers, and by the end of 1917, over 50,000 out of the population of 400,000 had enrolled for overseas service. See CANADA and consult works there referred to.

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S. DUNN SCOTT,
Editor of News-Advertiser, Vancouver.

BRITISH EAST AFRICA, a name defining a vast district between Tanganyika Territory and the Italian protectorate of Somaliland. With a coast line of about 400 miles, it extends from the Indian Ocean inland to the Belgian Kongo and contains the valley of the upper Nile and the mountainous region of equatorial Africa. Included within its area are the East Africa Protectorate, the Uganda Protectorate and the islands of Zanzibar and Pemba. The total area is estimated at over 1,000,000 square miles, and the population at between seven and eight millions, largely composed of Bantu tribes, among which are the Waganda and Wangoro, Masai and Galla tribes; Swahali and Arabs on the coast, and negroes on the Nile. The coast is unhealthful for Europeans, but the interior highland plateaus are salubrious, and of great fertility. With the suppression of slavery and the slave trade and the construction of roads, railways, telegraphs, telephones, etc., the government is gradually opening up the interior to civilization. Ivory, gum, india rubber, cocoa nuts, copra, coir maize, rice and hides are exported. Coffee plantations, stock raising and ostrich farming are the chief of modern developments (See EAST AFRICA PROTECTORATE; UGANDA PROTECTORATE; ZANZIBAR). Consult Drumkey, Y. S. A., ‘Year-Book for British East Africa’ (Bombay); Playne, S., ‘British East Africa’ (London 1910); Stigand, C. H., ‘The Land of Zinj — An Account of British East Africa’ (London 1913).

BRITISH ECONOMIC ASSOCIATION. See ROYAL ECONOMIC SOCIETY.

BRITISH EMPIRE, the aggregation of states, self-governing colonies, dependencies and protectorates which is subject in the last resort to the British Parliament. Officially it was not entitled to the name till 1876, when Queen Victoria assumed the title Empress of India; but the term was in current use long before. It is the largest body of land and of people under any one jurisdiction on the globe, comprising about one-fourth of the earth's surface, and one-fourth of its inhabitants: over 11,500,000 square miles, exclusive of Egypt, and Egyptian Sudan, or 12,500,000 with them, and 400,000,000 population. Extensive portions of it lie in each of the five grand divisions of the globe: about 121,000 square miles in Europe, 3,700,000 in America, 1,880,000 in Asia, 2,700,000 in Africa, 3,175,000 in Australasia. Its organization is entirely different from that of any other «empire» in history. The control of the central government over the outlying sections varies from autocracy to a merely nominal control;

the most valuable parts are the least controlled, and have become the most valuable largely by that freedom. None of them pay any taxes into the imperial treasury, and the mother country derives her profit from them solely through trade relations and as furnishing employment for the overflow of British youth. Indeed, movements for independence are forestalled by the concession of whatever privileges are claimed by the self-governing colonies, even to the imposition of discriminating duties on British goods; and it is a postulate of British politics that no forcible resistance shall be offered if any of these wishes to withdraw altogether.

The nucleus of the empire is the United Kingdom of Great Britain and Ireland, ruled nominally by a hereditary sovereign; actually by a Parliament with one chamber popularly elected and the other composed of hereditary peers. Even the latter in practice almost invariably yields to the popular house when that body is firmly set on a given policy.

The subordinate portions fall under six classes: (1) Wholly self-governing communities: their sole ties to the mother country being an ornamental governor whose real functions are social and argumentative, the right of appeal from their Supreme Courts to the Engish Privy Council (even that curtailed in Australia), and the home government's nominal right of vetoing their laws, which, in fact, is never exercised. Canada, Australia and the Union of South Africa are the chief exemplars. (2) Those where the home government appoints part of the legislative body as well as the governor. This is entirely composed of the Channel Islands, Malta, Cyprus, Ceylon, Mauritius, Jamaica, the Leeward Islands, British Guiana and Rhodesia. (3) «Crown colonies,» where the ruling body, an executive and council (sometimes two councils, executive and legislative), are wholly oppointed by the home government, without local representation, and are directly responsible to the Colonial Secretary, except India, the greatest of this type, which is under a special secretary of state and home council. Of the others, the chief are the British settlements on the west coast of Africa —Sierra Leone, Nigeria, the Gold Coast, Gambia and Lagos; the Straits Settlements and Hongkong; in America, British Honduras, Trinidad, the Windward and Falkland islands; in Australasia, Fiji. The titles of these imperial rulers and of the group following are various: governor, commissioner, high commissioner, resident, etc. (4) Those administered by a single official under the Colonial Secretary, without a council. Such are Gibraltar and Aden, Ascension (under the control of the Admiralty); in Africa, Basutoland, Bechuanaland, and the protectorates of British Central and Eastern Africa and British Somaliland — administered respectively by the consul-general at Zanzibar, a resident commissioner and a consul-general at Berbera; and Egypt, a protectorate over which was assumed in December 1914 under a high commissioner. (5) Government by a trading corporation, licensed and supervised by the home government, formerly the chief colonial system in Europe, and the only intelligible object of colonization. Great Britain has now but one dependency of this type: British North Borneo, where the company's governor must be confirmed by the Colonial Secretary. (6) Mere control of a native government by a resident commissioner, or power to interfere if judged advisable, or sometimes scarcely more than the marking out of a «sphere of influence» within which other nations are debarred from meddling. The chief types of this class are some 40 native states of India, Zanzibar, Uganda and the native states of the Malay Peninsula.

In detail, the components of the empire, the dates and methods of acquirement and the title by which they are held, are as follows:

Europe.—(1) The United Kingdom. England in its modern sense, though much restricted toward the north, first owned a common overlord in 827; broken up by the Danes, it became a wholly Danish kingdom in 1013, again an English one in 1042, part of an Anglo-French system in 1066, and was practically restored to itself in 1214, with its northern limits as now. Wales was finally subjugated by Edward I, after a long war with Llewellyn ap Jorwerth, in 1284. Scotland, a kingdom owning overlordship to England, received a king by English arbitration in 1291, revolted and was conquered, revolted again and won its independence in 1314; with the accession of its King, James I, to the English throne in 1603 the two crowns were united, and in 1707 the Scottish Parliament was abolished and Scotland incorporated with England. The Isle of Man, a Scandinavian lordship, was ceded to Scotland in 1266 and to England in 1290. The Orkneys and Shetlands were pledged by Denmark to James III of Scotland in 1468 as security for his wife's dowry, and never redeemed. Ireland was invaded by Strongbow in 1169, and nominally annexed to England by right of conquest in 1172; but only a small cantle of it, «the Pale,» was effectively occupied till the time of Elizabeth, and the island as a whole was first effectively subjugated by Cromwell. It was governed by its own Parliament till 1800, when the Act of Union incorporated it with Great Britain. (2) The Channel Islands (Guernsey, Jersey, etc.), in the bay of Avranches off the French coast, are the sole remnants of the French possessions of the Angevin house. (3) The fortress rock of Gibraltar and the small plain at its foot on which the town is built were taken from Spain in 1704, during the war of the Spanish succession. (4) Malta, with Gozo, etc., islands south of Sicily, were taken from France in 1800, during the Napoleonic wars. Malta is the chief British naval station in the central Mediterranean.

Asia.—(1) India, with Burma. For the component parts of this mighty possession, three-fifths the size of the United States without Alaska, and for its government, see its name. Its nuclei were the three factories of the East India Company: Fort Saint George, now Madras, built 1639; Bombay, received from Portugal in 1662 as part of the dowry of Catharine of Braganza, Queen of Charles II; and Fort William, now Calcutta, founded by Job Charnock in 1686. The attempt of the French to build a colonial dominion on the ruins of the Mogul empire, in the 18th century, forced the company's local officers to act in self-defense, with the result that northeastern India fell into their hands, the decisive event being the battle of Plassey (1757). Wars, cessions, annexations, protectorates, residencies, etc., have gradually brought all the rest of the peninsula under English control. The company ceded its rights to the English government in 1858. (2) Ceylon, the tip of the Indian peninsula, is independently governed. It was taken by England from the Dutch in 1796, during the French wars, but not ceded to her till the Peace of Amiens in 1802. (3) Cyprus, an island south of Asia Minor: was ceded by Turkey in 1878, as a result of the Russo-Turkish War, in return for a treaty by which Great Britain agreed to defend Turkey against further territorial demands from Russia. (4) Aden, on the south coast of Arabia: was taken by the British in 1839 as a coaling station, in compensation for the maltreatment of shipwrecked British sailors by the natives. The island of Socotra to the east, off the mainland of Africa, was annexed in 1888; and the two — with Perim Island at the mouth of the Gulf of Aden and the Kuria-Murias on the east coast of Arabia — form one administration, a dependency of the Bombay presidency. (5) The Straits Settlements: This group, comprising the end of the Malacca Peninsula, was transferred in 1867 from the control of the Indian government to that of the Colonial Secretary. It consists of (a) Penang, formerly called Pulo Penang and later Prince of Wales Island, originally received by a British adventurer as dowry with a native chief's daughter, then turned over to the East India Company in 1786; (b) Malacca, occupied by the British in 1795, but not formally ceded to them by the Sultan of Johore till 1824, along with (c) the island of Singapore, the capital of the whole. Some of the native Malaccan states are also under British protection. (6) Hongkong, China, was occupied by the British in 1841 as a result of the opium war, and ceded to them in 1843. (7) Labuan, an island off Borneo, of which Great Britain obtained the cession in 1846, with great hopes of its coal mines and harbor not borne out by experience; it has also been a convict settlement. (8) British North Borneo, ceded to a commercial company by native sultans in 1877, but taken under British protectorate in 1888. (9) Brunei and Sarawak, southwest of the above, are governed by native rulers, but under British protection. (10) The Siamese states of Kedah, Perles, Kelatan and Trengganu, covering an area of 15,000 square miles, were added to the British sphere of influence in 1909.

Africa.—(1) Sierra Leone, on the west coast, was begun as a settlement of freed negro slaves in 1787; transferred to the Crown in 1807. (2) The Gold Coast: settlement of 1672 by the Royal African Company, made a dependency of Sierra Leone on the dissolution of that company in 1822, formally ceded by the Dutch in exchange for trade privileges in 1872, and made a Crown colony in 1874. (3) Gambia: settlement united with Sierra Leone in 1822, like the Gold Coast; made a separate colony 1843, reunited to Sierra Leone 1868, then included in the British West African Settlements colony till 1888, when it was again made a separate colony. (4) Lagos, West Africa: the town was an old slave mart destroyed by the British in 1851; the colony was ceded to them by the native rulers in 1861. (5) Nigeria: the Niger coast protectorate was constituted in 1884, old trading rights having been previously exercised for generations; the present protectorate of Nigeria was set up 1 Jan. 1901. (6) The Union of South Africa, comprising (a) Cape Colony: taken possession of as a derelict in 1795, the settlement having thrown off Dutch rule; administered for seven years, then returned to the Dutch; again captured in 1806, Holland having become part of Napoleon's empire; retained till the general peace of 1815, then bought from Holland for $30,000,000. (b) Natal and Zululand: taken from the Dutch settlers and annexed 1843. (c) Basutoland: annexed to Cape Colony 1871, as the result of an appeal by the Basutos from the claims of the Orange Free State; separated as a special protectorate 1884. (d, e) The Transvaal and the Orange River Colony: conquered 1900. (7) Zanzibar and Pemba. Pemba was ceded to the British East African Company in 1888 by the Sultan of Zanzibar. The latter island was given over to a German protectorate in 1886 by an Anglo-German convention; in 1890 transferred to England in exchange for the Island of Heligoland off the German coast, possessed by England and a thorn in the German flesh. (8) East Africa protectorate: recognized by Germany and France in 1890, with that of Zanzibar, for considerations as above and trading rights, and the recognition of the French protectorate over Madagascar. (9) Central Africa protectorate, organized 1891 from the territories of the British South Africa Company. (10) Bechuanaland, constituted a protectorate over native South African tribes in 1895 and a part of the province of Cape of Good Hope. (11) Rhodesia: the territories of the British South African Company, chartered in 1889, were brought under the colonial office in 1898, with Matabeleland and Mashonaland. (12) British Somaliland, completing the circle around Africa up to Socotra and Aden; protectorate under the East India Company 1884, constituted a Crown colony 1898. (13) Egypt, nominally under Turkish suzerainty, but virtually controlled by the British government since 1882, was formally declared a British protectorate in December 1914.

North America.—(1) The Dominion of Canada is the chief. Its nucleus was the territory which fell under British sway by the French and Indian War 1755–60, definitely ceded in 1763. The greater part of this was divided in 1791 into Upper Canada and Lower Canada, the former as a real settlement founded by loyalist refugees from the United States, who also founded New Brunswick. England also held north of the United States: (a) Nova Scotia, conquered from the French in 1713, after a previous occupancy 1654–67; (b) Cape Breton, conquered 1748, and restored to France; conquered again in 1758 and ceded by France in 1763, when it was annexed to Nova Scotia; again separated 1784, again united 1820; (c) Prince Edward Island, till 1799 called Isle Saint Jean or Saint John's Island, then changed in honor of the Duke of Kent; captured from the French 1745, restored, again taken and held in 1758, ceded 1763 and annexed to Nova Scotia; in 1773 again separated. (d) Newfoundland, an old fishing station, ceded by France in 1713. In 1841 Upper and Lower Canada were united. In 1867 the united province was joined with Nova Scotia and New Brunswick into the Dominion of Canada. In 1871 this was joined by British Columbia, formed 1866 out of the older British Columbia and Vancouver Island, the former organized 1858 from the old Hudson Bay territory of New Caledonia; the latter a Hudson Bay territory made a Crown colony in 1849. In 1873 Prince Edward Island also came into the Dominion. Meantime, in 1869, it had acquired the Northwest Territories, and in 1870 set off Manitoba and at once admitted it into the Dominion. The provinces of Saskatchewan and Alberta were created in 1905. There remain the Northwest Territories, north of the Prairie provinces, and the Yukon Territory in the extreme northwest of the Dominion. (2) Newfoundland, which still refuses to join the Dominion: its history is outlined above. Labrador forms a part of Newfoundland for administrative purposes. (3) The Bermuda Islands: settled 1609. (4) The Bahama Islands: ceded by Spain 1783, after alternate conquest and reconquest. (5, 6) The Windward Islands and the Leeward Islands: taken by the English in the general agreement with France for partitioning the West Indies in 1660. (7) Jamaica, with Turk's Island and Caicos Island: taken from the Spaniards in 1655. (8) Barbados: colonized 1625, made a Crown colony in 1663. (9) Trinidad, with Tobago: captured in 1797 during the French wars. (10) British Honduras: settled early in the 18th century, but not ceded to Great Britain by treaty from Spain till 1783, formerly known as Balize or Belize. (11) British Guiana: partitioned off from the other Guianas in 1803, and formerly ceded by treaty in 1814.

South America.—The Falkland Islands, east of the southern tip of the continent: fought for by British, French and Spanish for many years; then nominally controlled by Argentina till 1833, when the British took possession of them for a finality, and established a colony in 1851; it includes also South Georgia to the eastward.

The South Atlantic.— In the No-Man's Land between South America and Africa, and unrelated to either, the British hold three islands. (1) Saint Helena: definitively secured from the Dutch by the East India Company in 1673, transferred to the home government in 1834. (2) Ascension: 700 miles northwest of Saint Helena, settled in 1815 after Napoleon's deportation. (3) Tristan d'Acunha: a triad of little islands about half-way from the Cape of Good Hope to South America, garrisoned by the British in 1816 while Napoleon was at Saint Helena.

Australasia.—(1) The Confederation of Australia, formed 1901. The first colony in Australia was the convict settlement of New South Wales, made a self-governing colony in 1841. Western Australia was founded in 1829, South Australia in 1836. Victoria, settled in 1835 as Port Philip, was set off from New South Wales in 1851. Queensland was settled from Moreton Bay in 1825. Tasmania was a convict settlement of the Island of Van Diemen's Land from 1803 on, but in 1852 the convict deportation there was stopped, and the colony made self-governing under the name of Tasmania. (2) New Zealand was colonized in 1845. (3) The Fiji Islands came under British sway in 1874 by voluntary cession from Thakombau, the leader of the native chiefs. (4) British New Guinea was delimited and formally annexed in 1884. (5) There are a considerable number of islands in the western Pacific which have come into British hands at various periods, by occupation. The largest are the Tongas, part of the New Hebrides and the Solomons, Ellice, Gilbert, Union, Cook and Monahiki. (See Great Britain; War, European-Peace Treaties). Consult Dilke, C. W., 'The British Empire', (London 1898); Goldman and others, 'The Empire and the Century' (1905); Payne, 'Colonies and Colonial Federations' (Oxford 1905); Seeley, J. R., 'The Expansion of England' (London 1883); 'The Growth of British Policy' (2 vols., London 1895).

D. S. Douglas,
Editorial Staff of The Americana.

BRITISH AND FOREIGN SCHOOL SOCIETY, an organization which arose out of a society founded by Joseph Lancaster (q.v.) and two of his supporters in 1808, for the purpose of educating the poor children of the realm. In 1814 the Society separated from Lancaster and adopted the name it now holds. The aim of the Society was reformed to include the encouragement of the formation of local committees to found schools, train teachers, maintain the voluntary basis and to teach the Bible on undenominational lines. The Society had representatives in all parts of the world. It founded normal schools, kindergartens, published textbooks and spread propaganda for the advancement of education. It still supports some 1,500 schools, its chief work being in the training of teachers for elementary schools. Consult Binns, H. B., 'A Century of Education, 1808–1908' (London 1908).

BRITISH GUIANA, gē-ăn'ạ. See Guiana.

BRITISH GUM. See Dextrin.

BRITISH HONDURAS. See Honduras.

BRITISH INDIA. See India.

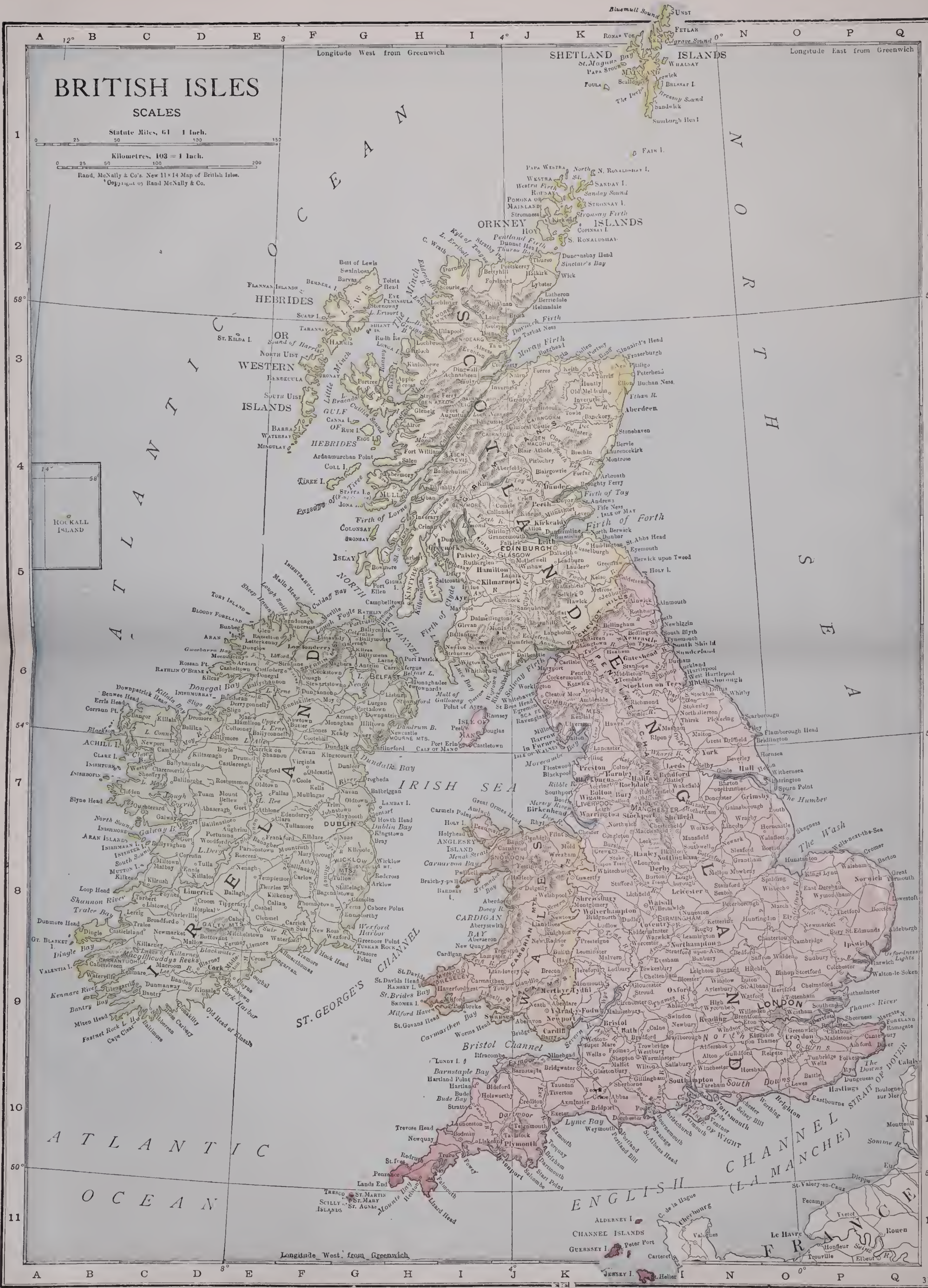
BRITISH ISLES, or **BRITISH ISLANDS,** a popular name applied to the United Kingdom of Great Britain and Ireland, most frequently, though incorrectly, called «England.» The name «Great Britain,» strictly speaking, means only England and Scotland, and was first used by James VI of Scotland when he acceded to the English throne. In official writings that term has since been employed to designate the whole country — the United Kingdom, of which the genetive and adjectival form is the word «British,» in the same sense as «American» signifies «of the United States.» The official form, «Britannic,» is not commonly used except in such phrases as «His Britannic Majesty's Consul-General,» etc. In compound words, where the name of the United Kingdom comes first, the adjective «Anglo» is used; when last, the term «British» is employed, e.g., «Anglo-American,» «Franco-British.» The absence of any strict definition has at times given rise to some local jealousy; hence the term «British» may be regarded as a compromise to include the English, Irish, Scottish and Welsh peoples, and «British Islands' as a convenient name for the region covered by the United

Kingdom. Beyond that region, "British Empire" and "Greater Britain" are popular expressions denoting all the self-governing dominions, colonies and protectorates which acknowledge the British Crown. Thus the official title of the sovereign is "George V, R.I., by the Grace of God, of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India." This title was declared by proclamation 9 May 1910, under the Royal Titles Act, 1901.

The British Islands are composed of two large islands, Great Britain (England, Scotland and Wales) and Ireland, and over 5,000 smaller islands and rocks, with a total area of 121,633 square miles, inhabited (1911 census) by a population of 45,370,530. The United Kingdom represents in area about an 80th part of the British Empire exclusive of India; it has just 1,000 square miles less than the State of New Mexico, and comes eighth in order of size among the European countries. The whole land and sea area of the British Islands lies practically within a quadrilateral of 10 degrees of latitude and longitude. They are situated at the northwest corner of Europe, with which Britain was at one time connected. There is evidence that Britain was inhabited before that connection was severed. It is a matter of conjecture whether these primitive people died out entirely. Their successors must have come by sea, and consequently must have been sufficiently advanced to construct and navigate large boats. The coast, where the white cliffs of Dover are plainly visible from the other side of the straits, was close enough to the Continent to tempt the adventurous and to offer a refuge to fugitives from the hostility of stronger neighbors. Both Britain and Ireland thus became inhabited in one way or another about which history furnishes no dates. Though Aristotle knew of the existence of the islands, nothing beyond a few casual notices have come down to us until the Roman conquest in B.C. 55. Some 300 years before that epoch the Greek colonist Pytheas from Massilia had discovered and sailed along the east coast of Britain, and was able to report that the inhabitants practised agriculture, brewed beer and mined tin. Successive invasions by Celtic tribes occurred across the channel, and when Cæsar arrived he found the coast inhabited by the Belgæ, while less civilized Celts in the interior were already being pressed toward the western mountains. For several centuries after the departure of the Romans Britain was exposed to raids and invasions. Then came the Norman Conquest (1066), and England was brought into closer touch with the Continent, yet the natural insularity of the people so influenced their foreign rulers that 200 years later the Norman or French descended Edward I (q.v.) was thoroughly English, and it was he who began the task of uniting Britain. Not until three centuries later was that task completed. Ireland is separated from Britain by an arm of the sea which in places is no wider than the Straits of Dover, yet this dividing sea has doubtless contributed in no small measure to keeping the people of Ireland much more apart from England in character and sentiment than the Scots and the Welsh. The geographical situation of Ireland made it inevitable that she should be politically united with the larger island in some shape or form. If Ireland had lain nearest to the Continent, it might have fallen under the control of France as easily as under England: it would in either case have been a bone of contention between the two. That there exists in fact so much hostility to England among the Irish people is an unfortunate illustration of the power which sentiment can exert to override the natural tendencies due to geographical and other considerations of common interests.

The historic event that most profoundly affected the British Isles geographically was the discovery of America. A statue of Columbus in Sefton Park, Liverpool, bears the inscription, "The man who discovered America made Liverpool." In a wider sense, that discovery shaped the future greatness of the islands. Up to 1492 the geographical position of those islands was rather a disadvantage than otherwise. Their insularity was no safeguard against invasion; that later attempts, such as that of the Spanish Armada, were frustrated was due mainly to good luck and fortuitous circumstances. Furthermore, the islands were geographically the northwestern cul-de-sac of Europe; mariners who visited the shores of Britain had perforce to return the way they came, since there was no beyond. The discovery of America, however, at one stroke transformed an outlying "blind alley" into the most important station on the ocean highway between the Old World and the New. From that moment an overwhelmingly powerful fleet, in other words, command of the sea, became a logical necessity dictated by the first law of nature and a highly vulnerable position. In an ideal world, where wars are unknown, such necessity would obviously not arise. But neither the newly-created geographical position nor the subsequent maritime capacity of its people could alone have built the foundations of Greater Britain without the natural mineral wealth of the islands — the vast resources of coal and iron. Another equally important — and purely geographical — feature is the great natural harbors around the British Isles: Liverpool, Portsmouth, Southampton, Glasgow, Leith, Plymouth, Belfast, Hull, London, etc. The accident of geography gave the 13 original States of the American Union a vast and solid "hinterland" of over 2,000,000 square miles for future expansion; less favored in regard to original area, it was primarily the accident of geographical position and its influence upon the inhabitants of the British Islands that made possible the creation of Great and Greater Britain. See BRITISH EMPIRE; GREAT BRITAIN; IRELAND; SCOTLAND; WALES.

BRITISH LEGION, The, a corps raised in Great Britain in 1835, numbering 10,000 men, under the command of Gen. De Lacy Evans, to assist Queen Isabella of Spain in the war with Don Carlos. They rendered much assistance to the Queen, defeating her Carlist rivals in several battles, notably at Ayetta, during the two years of their campaign. General Evans was himself defeated at Hernani in 1837, but subsequently captured that place and also several others. He acted in conjunction with a naval force under Lord John Hay.

# BRITISH ISLES

SCALES

Statute Miles, 61 = 1 Inch.

Kilometres, 103 = 1 Inch.

Rand, McNally & Co's. New 11×14 Map of British Isles.

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BRITISH MUSEUM, a national depository of science, literature and art, in London, which owes its origin to the will of Sir Hans Sloane, an eminent physician and naturalist, who, dying in 1753, bequeathed to the nation his collection of medals and coins, antiquities, seals, cameos, drawings and pictures, and his library, consisting of 50,000 volumes and manuscripts, on the condition of the payment of $100,000 to his heirs. This offer was agreed to by Parliament, which authorized a lottery of $500,000 to implement the bargain, as well as to purchase other collections. Montague House, which was bought for the purpose, was appropriated for the museum, which was first opened on 15 Jan. 1759. The original edifice having become inadequate, a new building was resolved on in 1823, the architect being Sir R. Smirke, whose building was not completed till 1847. It forms a hollow square, facing the cardinal points. The south, or Russell street front, is the principal one, having an imposing columnar façade of the Ionic order. This, as well as the other three, looks into the central square court, which measures about 320 feet by 240. There are two stories of galleries and rooms round the greater part of the building. Smirke's designs were no sooner completed than it was found that additional accommodation was needed in various departments, and several new rooms were provided; but the library accommodation being wholly inadequate for the accommodation of the readers, as well as for the reception of new books, a grant was obtained from Parliament for a new library building in 1854, and it was completed and opened in 1857, at a cost of $750,000. It was erected in the interior quadrangle and contains a circular reading-room 140 feet in diameter, with a dome 106 feet high. The whole arrangements were completed with the utmost economy in regard to space, and, besides ample accommodation for books, the reading-room contains accommodation for 300 readers comfortably seated at separate desks, which are provided with all necessary conveniences. The accommodation having become again inadequate, it was resolved to separate the objects belonging to the natural history department from the rest and to lodge them in a building by themselves. Accordingly a large natural history museum was erected at South Kensington and the specimens pertaining to natural history (including geology and mineralogy) were transferred thither, but they still form part of the British Museum. Subsequent additions to the main museum building include the southeast White Wing, built in 1879, and the Annex, opened in 1911. The British Museum is under the management of 48 trustees, among the chief being the archbishop of Canterbury, the Lord Chancellor and the speaker of the House of Commons. In all, the staff of the institution numbers over 320 persons. The museum is open daily, free of charge. Admission to the reading-room as a regular reader is by ticket, procurable on application to the chief librarian, there being certain simple conditions attached. An average of over 220,000 persons use the reading-room and over 720,000 persons visit the general collections annually. The institution contains over 4,000,000 volumes in the department of printed books. A copy of every book, pamphlet, newspaper, piece of music, etc., published anywhere in British territory must be conveyed free of charge to the British Museum. There are various catalogues and handbooks prepared by the officers of the museum and containing classified descriptions of the contents of the different departments. Of these there are eight, namely, the department of (1) printed books, maps, charts, plans, etc.; (2) of manuscripts; (3) of natural history; (4) of Oriental antiquities; (5) of Greek and Roman antiquities; (6) of coins and medals; (7) of British and mediæval antiquities and ethnography; (8) of prints and drawings.

BRITISH NORTH AMERICA, the Dominion of Canada and the Island of Newfoundland, with the portion of Labrador belonging to the latter. The Bermudas are also included.

BRITISH NORTH BORNEO. See BORNEO.

BRITISH SOUTH AFRICA. See BASUTOLAND; BECHUANALAND PROTECTORATE, ETC.

BRITISH SOUTH AFRICA COMPANY, a corporation established 29 Oct. 1889, with a royal charter, by Cecil Rhodes and others, for the purpose of controlling, settling, administering and opening up by railways and telegraphs, etc., certain districts in central South Africa. Mashonaland was first settled, and, in 1893, Matabeleland was annexed and settled after the defeat of King Lobengula. In 1895, North Zambesia, in British Central Africa, was added, as well as a strip of territory in the Bechuanaland protectorate. This territory, called Rhodesia or British Zambesia, has an area of about 500,000 square miles. In consequence of the filibustering raid of Dr. Jameson, an officer of the company, near the close of 1895, Rhodes resigned his connection with the company in 1896, and a joint administrator of the territory was appointed by the British Crown. See RHODESIA.

BRITISH WEST INDIES. See WEST INDIES.

BRITISH WEST INDIES, Diplomatic Relations with. American interests in the West Indies, which began through trade before the Revolution, were increased later by acquisitions bordering on the Gulf of Mexico in a period of the steadily increasing interests of Great Britain, which had the advantage of naval control. The first movement of the Revolution may be regarded as beginning with the Sugar Act of 1764, which suddenly threatened to cut off the important New England trade with the foreign West Indies, regarded by New England as necessary to satisfy the large demand for sugar which the British Islands could not entirely supply.

In the Revolution, the Continental Congress contemplated the acquisition of the Bermudas, and the destiny of the United States was partly determined by naval strategy in the West Indies, which, during the war, were also the chief source of American foreign trade.

The British West Indies, which suffered their first commercial decline during the Revolution, were again injured after the Revolution by British orders practically prohibiting trade in American ships — a policy which was against the best interests of the islands. An unratified provision of the Jay treaty of 1794 granted the right to direct trade in American ships of not over 70 tons, but forbade American ships to carry molasses, sugar, coffee, cocoa and cotton from either the West Indies or American ports to any part of the world except the United States — conditions to which the American Senate refused to agree.

In 1806, in the attempt to negotiate a treaty to replace the expired clauses of the Jay treaty, the American government made an unsuccessful effort to induce the British government to reconsider its stricter policy and to restore the West India trade to a footing of 1801. The commerce treaty of 1815, although it opened to America the East India trade, did not mention the question of the West Indies, but its provisions indirectly resulted in encouraging British ships to carry American products to the West Indies and thereby gave to British ships an advantage in the direct trade between England and the United States, causing American merchants and skippers to turn to the Orient — to China and the East Indies. The decade which followed was characterized by extensive smuggling in the West Indies and retaliatory shipping legislation. In 1818, after commissioners failed to secure larger privileges in the West India trade, Congress closed American ports to all British ships from the West Indies and compelled all vessels leaving American ports to give bond not to unload their cargo in those islands — causing great injury to American industries and commerce. After the failure of new proposals, Congress retaliated again by act of 1820, excluding the United States from any intercourse whatever with the West Indies — an act which resulted in the opening of a continual and unrestricted trade of the West Indies with Canada and New Brunswick. In 1822, Parliament by repeal of existing statutes opened certain West India ports to direct American trade, although subject to heavy duties and exclusion of certain important articles of export. The United States promptly opened its ports to goods of the British West Indies imported in British bottoms and allowed exports to the West Indies to be carried in British vessels.

In 1825, Parliament, although reserving the coasting trade, by a somewhat obscure act opened the ports of her colonies to nations without colonies on the same shipping terms as such nations gave to England and her possessions, but Congress neglected to pass the necessary legislation to accept the offer within the year stipulated by the act. In 1826, by an order in council, American vessels were definitely excluded from the West Indies. Thereupon President Adams, in 1827, revived the prohibitive provisions of the acts of 1818 and 1820. As a result of this battle of legislation and decree, neither British nor American vessels could trade between the United States and the British West Indies (except as smugglers).

In 1829, the Jackson administration asked for the reopening of the West India trade as a privilege on the terms of the act of 1825, and in 1830 the British government opened the trade, allowing American vessels to import any articles which could be imported on British vessels from the United States and to export from the West Indies to any country except British possessions any article which a British vessel could export.

The Parliamentary Emancipation Act of 1833 for the gradual extinguishment of colonial slavery in seven years, the consequent British policy of encouraging emancipation elsewhere and the activity of the British government and the British navy in attempts to stop the illegitimate foreign slave trade which usually eluded capture by flying the American flag, greatly affected public sentiment in the United States and American relations with the West Indies. Among other sources of friction was that arising from the interstate slave trade by sea in American vessels from Chesapeake ports to Charleston or to New Orleans, or from Charleston to New Orleans, and stopping at the British West Indies ports of the Bahamas, where under British jurisdiction the slaves were set free. In 1840, after long negotiations, England allowed indemnity in the cases of the *Comet* (wrecked 1831) and the *Encomium* (wrecked 1833). She refused payment in the case of the *Enterprise* (driven by stress of weather 1840). In the famous case of the *Creole* (1841), arising from a mutiny of the slaves, who carried the vessel into Nassau and were discharged by the British authorities, no agreement could be reached by 10 years of negotiations; but finally, by arbitration of Joshua Bates, an American-born English banker, England paid an indemnity. Bates also decided that an indemnity was due in the case of the *Enterprise* and in the case of the *Hermosa* (wrecked 1841). For nearly two decades before the American Civil War, American foreign policy relating to the West Indies was largely influenced or dominated by apprehensive fears of American slaveholders that the safety of slavery in the Southern States might be endangered by the effects of emancipation in the British West Indies, through its influence upon neighboring islands and upon general British policy in the entire region, especially in Cuba. In the Civil War, the Bermudas or Nassau were used as stations from which blockade runners carried European goods into Confederate ports and returned with cotton — a very lucrative business. At Nassau the Confederate cruiser *Florida,* after escaping from England in 1862, was allowed by near-sighted officials to arm and equip itself as a man-of-war and later to remain in port beyond the time allowed by international law. As a result of such incidents, which doubtless prolonged the war, the United States felt the need of West India harbors and naval stations, and after the war sought to strengthen its position by the acquisition of the Danish West Indies and San Domingo.

In 1884, when the United States, under a reciprocity policy inaugurated by President Arthur in 1882, recognizing the need of less obstructed traffic with Cuba and Porto Rico, took steps to succor languishing Spanish interests in the West Indies by proposing a treaty of commerce to place trade on a more favorable footing (and negotiated a draft treaty which was later withdrawn from the Senate by President Cleveland), the British government made overtures for a like mutual extension of commercial intercourse with the British West Indies and South American dependencies, but without results. On 4 Dec. 1884, Secretary Frelinghuysen submitted to the British representative at Washington a project of a convention for commercial reciprocity between the United States and the British West Indies, but the British representative could not agree to the interpretation of the most-favored-nation clause.

Under provision of the McKinley tariff bill, John W. Foster, in 1891, entered into reciprocity arrangements with Jamaica, Trinidad, British Guiana, Barbados, Leeward Islands and Windward Islands, nominally through negotiations with the British Minister but really by separate conferences with delegations from each of the colonies. Jamaica hesitated, and reached an agreement with considerable difficulty.

Since the Spanish-American War, resulting in an American protectorate over Cuba and American possession of Porto Rico, the United States has had a larger control in the entire Caribbean region — a control to which Great Britain contributed by reduction of her West India armaments following the Hay-Pauncefote treaty of 1901, resulting in American naval supremacy in the Caribbean. Coincident with these events, the British West Indies in trade relations have been growing more dependent upon the American market. They were quick to recognize that the probable entrance of Cuban and Porto Rican sugar into the United States free of duty would have important significance in relation to their commercial and political future. In Jamaica and at a conference in Barbados, in August 1898, there was much discussion in favor of annexation to the United States in case Great Britain should fail to take action for protection of their sugar interests.

Economically the British West Indies have become an appanage of the United States, dependent for their prosperity upon favorable American customs duties. For this reason Trinidad and other islands hesitated to enter the Canadian preferential agreement of 1913 which is now in force. The recent gravitation toward the United States has resulted in propositions for a vigorous Caribbean confederation with a responsible government as a means to counteract this tendency.

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BRITO CAPELLO, brē'too kä-pĕl'oo, **Hermenegildo Augusto de**, Portuguese sailor, African explorer and administrator: b. 1839. His connection with the 1877 and the 1884 expeditions of Maj. Serpa Pinto and Robert Ivens to explore Portuguese Angola brought him into prominence, and their scientific work, of great meteorological, mineralogical, botanical, zoological and ethnographical value, was honored by both the Madrid and the Paris Geographical societies. Brito Capello, who had been advanced to the rank of captain in 1880, received the Portuguese Military-Naval Grand Cross and, with Ivens, the gold medal of 1886 from the Paris Geographical Society. Brito Capello was Portuguese commissioner in the matter of the boundaries of Zanzibar and Mozambique in 1887, and later was governor of the province of Loanda. Consult H. A. de Brito Capello and R. Ivens, 'De Benguella as terras de Jacca' (2 vols., illustrated, 1881), and 'De Angola a Contra-Costa' (2 vols., illustrated, 1886).

BRITOMARTIS, a nymph of Cretan mythology, fabled to have been raised by Artemis into a deity, on the occasion of drowning herself to escape from the pursuit of Minos. She was presented as patroness of hunters and fishermen. The name was chosen by Spenser to represent in the 'Faerie Queene' the personification of chastity, and thus contained an allusion to the Virgin Queen, Elizabeth.

BRITTANY, or **BRETAGNE**, a former province of France, a peninsula washed by the Atlantic on all sides except the east, where it joined Poitou, Anjou, Maine and Normandy. It now forms five departments, Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, Loire-Inférieure, containing nearly 3,327,000 inhabitants on 13,130 square miles. It is supposed to have received its name from those Britons who were expelled from England and took refuge here at various periods between the 5th and 7th century. Before that time it bore the name of Armorica. It formed one of the duchies of France, and was held by sovereigns nearly independent and often at war with the French monarchs till it was united to the crown by the marriage of Louis XII with Anne of Brittany, the widow of Charles VIII, in 1499. It was given by Louis XII to Claude, Countess of Angoulême, who married Francis I, and was reunited to the crown in 1532. The province was divided into Upper and Lower Brittany. Agriculture in this territory is very backward, and it is estimated that about one-half of the surface lies waste. Corn and wine are produced in small quantities. Flax and hemp, apples and pears are abundant and of good quality. Cider is the principal drink. Salt is made on the coast, and coal, lead and iron are found in various parts. There are manufactures of hemp, flax and iron. The fisheries also employ many of the inhabitants. Brest, Nantes, Lorient, Quimper, Saint Brieuc and Saint Malo are important seaport towns. The people of Brittany still retain their ancient language, which is closely allied to Welsh, and is exclusively used by the peasantry in the western part of the province. Many Celtic remains — megalithic monuments — are found throughout the country.

BRITTLE STAR, also called **SNAKE STAR**, and **SAND STAR**, a member of the order of *Ophiuroidea*, class *Asteroidea*, of the phylum *Echinodermata* (q.v.), a class of starfish-like echinoderms. It is characterized by the body forming a flattened disc, with cylindrical arms, the stomach not extending into the arms, and there is no intestine or anal opening. The ambulacral furrow is covered by the ventral shields of the tegument, so that the ambulacral feet project from the sides of the arm. It moves faster than the true starfish, the arms being more slender and flexible and more easily broken. An ophiuran which has accidentally lost an arm can reproduce it by budding. In species of *Ophiothela* and *Ophiactis* the body divides in two spontaneously, having three arms on one side and two on the other, while the disc looks as if it had been cut in two by a knife, and three new arms had then grown out from the cut side.

Few specimens reach a size in excess of an inch in diameter and the rays seldom exceed 10 inches in length. The ophiurans in most cases undergo a decided metamorphosis like that of the starfish. The larva, called a «Pluteus,» is free-swimming, though in some species the young, in a modified larval condition, reside in a pouch situated above the mouth of the parent, finally escaping and swimming freely about. Our most common brittle star is *Ophiopholis aculeata,* which may be found at low-water mark, and especially among the roots of Laminaria thrown upon the beach. They have little means of defense, and so live under rocks or buried in mud and sand. They are nearly all vegetable feeders though possibly some are carnivorous. It is variable in color, but beautifully spotted with pale and brown, its general hue being a brick-red. Ophiurans are widely distributed, and live at depths between low-water mark and 2,000 fathoms. Fossil ophiurans do not occur in formations older than the Upper Silurian, where they are represented by the genera *Protaster, Palæodiscus, Acroura* and *Eucaladia;* generic forms closely like those now living appear in the mushcelkalk beds of Europe (Middle Trias). There are about 600 known species, of which few belong to the shore waters of the United States.

BRITTON, Elizabeth Gertrude, American bryologist or moss specialist: b. New York, 9 Jan. 1858. She was a daughter of James Knight and spent her early life in Cuba. A graduate of New York Normal College she later became teacher in the training department 1875–82, and was assistant botanist 1882–85, in that institution. In 1885 she married Nathaniel Lord Britton (q.v.). From 1885 to 1888 she edited the *Bulletin of the Torrey Botanical Club.* Her contributions to scientific journals and her interest in adding to and improving the collections of Columbia University and the New York Botanical Gardens have largely increased the general knowledge of mosses and ferns.

BRITTON, John, English archæologist: b. 7 July 1771; d. London, 1 Jan. 1857. In 1787 he came to London, and was employed for six years as cellarman in the Jerusalem Tavern, Clerkenwell, and afterward served in the same capacity in the London Tavern. He next entered the employment of a hop merchant in Southwark, and then an attorney's office in Gray's Inn. During all this period he had sedulously cultivated his taste for reading during his leisure hours, and took part in the proceedings of several debating societies. In 1799 he accepted an engagement from a Mr. Chapman to write, sing and recite for him at a theatre in Panton street, Haymarket, at a salary of three guineas per week. From this period his literary career may be said to have commenced, developing itself at first in the form of pamphlets, songbooks and similar minor subjects. He soon advanced, however, to a higher grade, and in 1801 appeared the first two volumes of the ‘Beauties of Wiltshire,’ by J. Britton and E. W. Brayley. These collaborateurs, with others, subsequently completed a similar work for all the other counties of England (1801–16, 18 vols.; 1825, 26 vols.). In 1805–14 Britton published his ‘Architectural Antiquities of Great Britain’ in four volumes, supplemented in 1818–26 by another entitled ‘Chronological History and Graphic Illustrations of Christian Architecture in England.’ These were followed by his ‘Cathedral Antiquities’ (in 14 vols., 1814–35); and the ‘Dictionary of the Architecture and Archæology of the Middle Ages’ (1832–38). In 1848 he attempted to prove that Isaac Barré wrote the letters of «Junius.» Consult his ‘Autobiography’ (2 vols., London 1849–50).

BRITTON, Nathaniel Lord, American scientist: b. New Dorp, Staten Island, N. Y., 15 Jan. 1859. He was educated at Columbia University and from 1879 instructed there as assistant, adjunct and professor of geology, botany and zoology until his retirement as professor emeritus in 1896, when he became director of the New York Botanical Garden. He wrote ‘Geology of Staten Island’ (1880); ‘Catalogue of the Flora of New Jersey’ (1882); and collaborated with Addison Brown in ‘An Illustrated Flora of the Northern United States, Canada’ (3 vols., 1896–98; 2d ed. revised and enlarged, 1913). Later works are ‘North American Trees’ (1908); ‘Studies in Cactaceæ’ (1913).

BRITZKA, a Russian traveling carriage, copied in England and Austria early in the 19th century, the head of which is always a movable calash, having a place in front for the driver, and a seat behind for servants. The body is so arranged that the traveler can sleep therein at night.

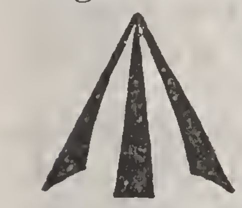
BRIVES-LA-GAILLARDE, bręv-la-ga-yärd (Ancient Briva Curretia), a town in France, department of Corrèze, situated amidst vineyards and orchards, on left bank of the Corrèze, about 18 miles southwest of Tulle, surrounded by a fine avenue of elms. The houses are substantially built of stone, but the streets are narrow, and the public squares indifferent. It contains a church of Saint Martin dating from the 12th century, some ancient houses in the Gothic style and a library. Its industries include the manufacture of leather, cotton goods, pottery, wax candles, etc., and it also carries on an active trade in truffles, wool, wine and nuts. There are also dyeworks and quarries of slate and millstone. The Romano-Gallic name of the place was Briva Curretia. It is the birthplace of Cardinal Dubois. Pop. 21,486.

BRIXHAM, an English town in Devonshire, situated on the English Channel, six miles south of Torquay. It covers the sides of two hills, and is divided into Upper and Lower Brixham. The parish church is a large ancient structure, in the Perpendicular style. The trade of Brixham is chiefly in fish, and is of considerable extent, London, Bath and Bristol receiving supplies from this place. The port possesses also a number of vessels engaged in the coasting and foreign trade; those in the latter plying chiefly to the Mediterranean. Shipbuilding and the manufacture of sails, ropes, paint, etc., are among the other industries. The Prince of Orange, afterward William III, landed, 4 Nov. 1688, where the quay of Brixham now stands. In 1858 a cave was discovered on Windmill Hill, containing the bones of extinct mammals, some flint implements, etc. Pop. about 7,954.

BRIZA, a genus of grasses, commonly called quaking-grass, maiden's-hair, or lady's-tresses. There are about 30 species, chiefly found in South America. *B. media* is a native of the United States, and is found occasionally in pastures in the eastern States.

BROACH, or **BAROACH**, India, seaport town in Guzerat, Bombay, situated on the Nerbudda, about 30 miles from its mouth. The river here is crossed by a railway bridge, and for about a mile in front of the town is lined with a massive stone wall. Broach is surrounded with ruinous walls, and has narrow streets, with houses mostly of two stories and built of brick. There are no buildings of interest. It is an ancient place, and one of the oldest seaports of western India, and was formerly famous for its cotton manufactures. The town was taken by storm by the British in 1772, and with the district, ceded to them by treaty with Scindiah in 1803. Formerly it had a great export of cotton, and it still carries on a trade in cotton, grain and seeds with Bombay and Surat. Pop. 42,300 (including many Parsees). The district of Broach lies on the east side of the Gulf of Cambay. Broach cotton holds the highest place in the Bombay market. Area 1,453 square miles; pop. about 350,000.

BROAD ARROW, a government mark placed on British stores, guns, etc., to distinguish them as public or Crown property. It was the cognizance of Henry, Viscount Sydney, Earl of Romney, master-general of the ordnance, 1693–1702, and was at first placed only on military stores. Persons in possession of goods marked with the broad arrow forfeit the goods and are subject to a penalty, and it is made felony by statute to obliterate or deface it. The mark is also used in the Ordnance Survey maps to denote points from which measurements have been made.



Broad Arrow

BROAD CHURCH, a name given originally to a party in the Church of England, regarded as being midway between the Low Church or Evangelical section and the High Church or Ritualistic; now widely applied to the more tolerant and liberal section of any denomination.

BROAD-HEADED SNAKE. See DEATH-ADDER.

BROAD MOUNTAIN, an elevation in the anthracite coal region of Pennsylvania; a plateau of conglomerated rock, about three miles wide and 2,000 feet above the sea, undulating just enough to contain three shallow coal-basins intermediate between the Pottsville and Mine Hill on the south, and the Mahoning and Shamokin coal-fields on the north.

BROAD PIECE, a term applied to some English gold pieces broader than a guinea, particularly Caroluses and Jacobuses.

BROAD RIVER, a stream of North and South Carolina, rising at the foot of the Blue Ridge, in the western part of the former State, and entering York district in South Carolina. It then takes a southerly course through a rich and highly productive tract of country covered with fields of maize and cotton, and finally unites with the Saluda to form the Congaree River. The city of Columbia is at their junction. The river is about 225 miles in length, and is navigable for shallow-draft boats for 140 miles above Columbia.

BROAD SEAL WAR, 1838–39, a disputed-election case in New Jersey and in Congress; turning in New Jersey on the power of a county official, in collusion with the State executive, to nullify the result of a State vote; in Congress on the right of the clerk to base official action on information not before Congress. New Jersey then elected her six congressmen on general ticket, and in 1838 that of the Democrats carried the State by an average of about 100; but the Whig county clerk of Middlesex County threw out the vote of South Amboy, with 252 Democratic majority, for lack of the election clerk's signature, and for other irregularities, giving the Whigs five of the six seats. The Democrats claimed that such technicalities had been repeatedly waived, and were countervailed by like ones in Whig towns; and, even so, that by law the governor and council, as a canvassing board, must send at once for any missing return and pass on its validity. Those officials were Whigs, however, and they decided that they could not go behind the clerk's certificate, and issued credentials to the Whig candidates under the «broad seal» of the State. This would have made only the usual party broil, but that the national House stood 119 Democrats to 118 Whigs without the New Jersey members, so that the decision carried with it control of the organization of Congress. The Democratic clerk of the House, H. A. Garland, of Virginia, on its meeting 2 Dec. 1839, omitted the New Jersey members in his roll-call, on the ostensible ground that their seats were to be contested and he must leave the decision to Congress; really because excluding them gave his party the speaker and the committees, and incidentally secured himself the clerkship however the contest was decided. This was utterly illegal, as there could be no contest till a congress was organized to bring a contest before; but he doubtless felt it as legitimate as the trick by which the Whig members were sent there, and that party could hardly complain of unfairness. For three days there was helpless rage and anarchy in the House, the clerk refusing to put the question upon any of the motions to bring order out of the chaos. Finally on the fifth the leaders of both parties called in John Quincy Adams (q.v.), the one member who had no party or affiliations of any sort, and who was respected as at once immutably just, unshrinkingly courageous and of the highest parliamentary knowledge. He called upon the meeting to organize itself, offered a resolution ordering the clerk to call the names of the New Jersey members with credentials, and on the clerk's refusal announced that he would put the question himself. He was at once elected speaker pro tempore, and for six days more the fight went on to choose a permanent speaker, with both New Jersey delegations voting. On the 11th a motion was carried that neither delegation had a right to vote till the contest was decided; on the 16th a compromise was made by which R. M. T. Hunter, of Virginia, a Whig who favored the Democratic sub-treasury scheme, was chosen speaker. On 10 March 1840 the Democratic contestants were seated; on 16 July the majority report of the committee on the case, declaring them duly elected, was accepted by a vote in which all but 22 Whigs refused to take part, on the ground that the report and testimony were too long to examine. The political prize at stake had caused the parties to exchange principles, as they did earlier on the Louisiana Purchase and later on the Electoral Commission; the Democrats, though strict constructionists, disregarded State certificates and insisted on going behind the returns; the Whigs, though upholding equity against forms, clung to the sanctity of a State certificate however obtained.

BROAD-TOP MOUNTAIN, a trapezoidal plateau of semi-bituminous coal measures, in Huntingdon and Bedford counties, Pa. The highest point is about 2,500 feet above the sea. It is surrounded by a red shale valley and an outside ring of Devonian rocks, called Terrace, Harmer and Sidelong mountains. Through gaps in this ring flows the Raystown branch of the Juniata. The mountain contains two principal coal basins. It contains in its deepest troughs about 900 feet of coal measures and takes in the Pittsburgh coal bed, with one of the limestones above it. Coal was mined here for blacksmithing nearly 100 years ago. The coal is a semi-bituminous steam coal, containing from 12 to 18 per cent of volatile matter, and of the same qualities as Cumberland coal.

BROADBENT, Sir **William Henry,** English physician: b. Yorkshire, 23 Jan. 1835; d. London, 10 July 1907. He was educated at the Royal School of Medicine in Manchester and at Paris. He was at first appointed physician to the Western General Dispensary; then physician to the London Fever Hospital and the Saint Mary's Hospital successively, and in 1881 became president of the Medical Society of London. He was physician-extraordinary to Queen Victoria 1898–1901, and in the latter year was appointed physician-in-ordinary to King Edward VII. He was a member of the Medical Society of London and was censor of the Royal College of Physicians 1888–89 and 1895–96. He wrote ‹The Pulse› and ‹The Heart.› A volume of selections from his writings was edited and published by Walter Broadbent in 1908, and his ‹Life› by his daughter in 1909.

BROADCASTING, a mode of sowing grain by which the seed is cast or dispersed upon the ground with the hand or a machine devised for sowing in this manner; opposed to planting in drills or rows; largely limited to the sowing of spring grains and grasses.

BROADHEAD, Garland Carr, American geologist: b. Albemarle County, Va., 30 Oct. 1827; d. Columbia, Mo., 15 Dec. 1912. He studied at the University of Missouri and was long the State expert in geology. He was professor of geology at the University of Missouri 1887–97, and considered an authority on the Missouri coal measures. He was a member of the jury on geology at the Philadelphia Centennial Exposition and in 1881 was a special agent of the 10th census for rendering a report of the quarrying industry of Missouri and Kansas. His writings include ‹Geological Survey of Missouri Iron Ores and Coal Fields›; ‹Geological Survey of Missouri,› and ‹Illinois Geological Survey Report› (1873). He contributed to the *Transactions* of the Saint Louis Academy of Science (Vol. II, 1868).

BROADHURST, Henry, English politician and labor organizer: b. Oxfordshire, 13 April 1840; d. 11 Oct. 1911. As a boy he worked in a blacksmith's shop, then as a stone mason till 1872. He has been prominent in the labor movement; in 1873 he was secretary of the Labor Representative League and in 1874 secretary of the Parliamentary committee of the Trades Union Congress. He was member of Parliament for Stoke-upon-Trent 1880–85, for Bordesley 1885–86, for Nottingham 1886–92. He was under-secretary for the Home Department in 1886 and for Leicester 1894–1906, and served on several royal commissions for the investigation of the condition of the laboring class. He wrote ‹Handy Book on Leasehold Enfranchisement› (with Sir R. T. Reid) and his ‹Reminiscences.›

BROADMOUTH, or **BROADBILL,** one of about a dozen species of small, lethargic, songless birds of the family *Eurylæmidæ,* having a notable breadth of beak. Flocks of these birds are distributed through the woods from the Himalayas to the Philippines. The broadmouths are brilliant in plumage and mainly fruit-eaters, with the exception of two species of the genus *Calyptomena,* which are insectivorous.

BROADS, The Norfolk, England, district in Norfolk and Suffolk, but principally in the former, so called from a series of lakes, surrounded by reedy marshes, formed by the widening or broadening out of the rivers. The broads par excellence are those of the Bure or North River (which empties into the sea at Yarmouth) and its tributaries, the Ant and the Thurne. The broads have grown greatly in favor with holiday-makers in recent years, but they have in consequence lost the charm of seclusion that once was theirs.

BROADSIDE, in a naval engagement, the whole discharge of the artillery on one side of a ship of war, above and below. The fighting power of a ship was formerly estimated by the weight of her broadside. The term is also applied to any large page printed on one side of a sheet of paper and, strictly, not divided into columns. In this sense it is sometimes called a broadsheet.

BROADSTAIRS, England, a watering-place in the Isle of Thanet, Kent, two miles northeast of Ramsgate. The name is derived from the width of the passage leading down to the sea. It was a favorite summer resort of Charles Dickens. Pop. 8,929.

BROADSWORD, a sword with a broad blade, designed chiefly for cutting, formerly used by some regiments of cavalry and Highland infantry in the British service. The claymore or broadsword was formerly the national weapon of the Highlanders.

BROADUS, Andrew, American clergyman: b. Caroline County, Va., 4 Nov. 1770; d. Salem, Va., 1 Dec. 1848. At the age of 18 he united with a Baptist church and began exhortations and preaching. His education had been limited, but he had a mind of more than ordinary capacity and an impressive and graceful elocution, which, added to his youthful appearance, made him a favorite as a preacher. In 1821 he became assistant pastor of a church in Richmond, and in 1832 he was moderator of the Dover Association of Baptist Churches. He declined the pastorate of the leading Baptist churches in Boston, New York, Philadelphia and various Southern cities and lived and died a country pastor. In 1843 the degree of D.D. was conferred by Columbian College, Washington, D. C., but declined. He wrote extensively for the press and published 'History of the Bible'; a 'Catechism'; 'A Form of Church Discipline'; the 'Dover' and 'Virginia Selections of Hymns,' both of which were long popular, and 'Letters and Sermons.' Consult his 'Sermons,' with a memoir by J. B. Jeter (New York 1852).

BROADUS, John Albert, American clergyman: b. Culpeper County, Va., 24 Jan. 1827; d. Louisville, Ky., 16 March 1895. He was educated at the University of Virginia and was professor of ancient languages there. He then became pastor of the Baptist church in Charlottesville and in 1859 professor of New Testament interpretation and homiletics in the Southern Baptist Theological Seminary at Greenville, S. C., now in Louisville, Ky. As a Greek scholar and New Testament critic Dr. Broadus stood at the head of the Baptists of the South, but his only publication in this department is an elaborate review of the American Bible Unions' revised version of the New Testament (in the *Religious Herald,* 1866 and 1868). In 1870 he published 'The Preparation and Delivery of Sermons,' which is still in use as a textbook in several theological seminaries. His other publications consist of sermons and review articles and a series of papers, 'Recollections of Travel,' in the *Religious Herald* (1872–73), describing a tour in Europe and the East; 'Lectures on the History of Preaching' (1877); 'Three Questions as to the Bible' (1884); 'Commentary on Matthew' (1886), and 'Sermons and Addresses' (1886).

BROADWAY, the chief thoroughfare, and the principal business street of New York city. Starting from Bowling Green at the lower extremity of the island, it runs nearly due north to 14th street, whence it takes a westerly diagonal course to 78th street, at which point it again runs due north to 103d street. Taking the westerly trend again to 108th street, it thence runs north again and, following the course of the old post-road, is continued under the name of Broadway as far as Albany. Its continuous course is interrupted by two public squares — Union square at 14th street and Madison square at 23d street. Below Madison square it is devoted mainly to office buildings and wholesale establishments, most of the offices of great corporations being below Chambers street. The chief shopping district has recently removed to above 34th street, and most of the theatres are in the vicinity of 42d street. Its length below 59th street is about five miles and is traversed by an electric railway. Above 59th street are many fine apartment-houses and hotels. Subways have been excavated under Broadway almost its entire length from Battery Park to 168th Street. An elevated section runs from 225th Street to 242d Street. The first grant of a lot on Broadway dates from 1643, when Martin Kregier erected, at what is now No. 9, a tavern, which was later known as Burns' Coffee House and Atlantic Gardens. Consult Jenkins, S., 'The Greatest Street in the World' (New York 1911).

BROADWOOD, John, English pianoforte manufacturer: b. Cockburnspath, Scotland, 1732; d. 1812. Going to London, he entered into partnership with a Swiss maker of harpsichords, named Burkhardt Tschudi, the firm being known as Tschudi & Broadwood. In 1769 his partner retired, and on his death four years later his son became a partner with Broadwood, but from 1783 till 1795, when Broadwood's son entered into partnership with him, he had the sole control of the business. The firm has long been known as John Broadwood & Sons. By the skill of Broadwood and those associated with him many improvements were introduced in the construction of the pianoforte, and for a long time the history of the firm was practically the story of the progressive development of that instrument.

BROBDINGNAG, an imaginary country described by Dean Swift in 'Gulliver's Travels.' The inhabitants are represented as being of enormous size and the details of their environment in proportion, whence has arisen the adjective «brobdingnagian.»

BROCA, brō-kä, **Pierre Paul,** French surgeon and anthropologist: b. Sainte Foy-la-Grande, department of the Gironde, 28 June 1824; d. Paris, 9 July 1880. In 1841 he began the study of medicine at Paris, became hospital surgeon in 1844, anatomical assistant in the faculty of medicine in 1846, preparator in anatomy in 1848, and professor of surgical pathology in 1867. Between 1861 and 1865 he carried out his famous researches on the localization of cerebral functions, discovering the seat of articulate speech in the third convolution of the left frontal lobe of the brain, commonly called the «convolution of Broca.» He gained great distinction in anthropology, and in 1859 founded the Paris Anthropological Society. During the Franco-German War he engaged in hospital work at La Pitié, but when peace was concluded he resumed his teaching. In 1872 he founded the *Revue d'Anthropologie,* and four years later he established the Ecole d'Anthropologie, which formed the nucleus of the later Institut Anthropologique. After 1880 he was perpetual senator. He took great interest in literature and philosophy and is known widely as a brilliant conversationalist. Besides writings on a wide range of subjects, and contributions to the Anthropological Society's *Revue,* he published the famous 'Des anéurysmes et de leur traitement' (1856); 'L'Ethnologie de la France' (1859); 'Recherches sur l'hybridité animale en général et sur l'hybridité humaine en particulier' (1861); 'Traité des tumeurs' (1865–69); Mémoires sur les caractères physiques de l'homme préhistorique' (1869); and 'Mémoires d'anthropologie' (4 vols., 1871–83). Consult 'Correspondence de Paul Broca' (2 vols., Paris 1886); biography by Pozzi (Paris 1880). A statue of him by Choppin was unveiled at the Ecole de Médecine in 1887.

BROCADE (Sp. *brocado,* It. *broccato,* cf. Fr. *brocher,* to *stitch, embroider*), a fabric having a pattern of raised figures; often a stuff of silk, enriched with a raised pattern of flowers, foliage and other ornaments. Formerly it signified a stuff woven all of gold or silver threads, or in which silk was mixed with such threads; at present all stuffs are so called if they are worked with raised flowers or other figures, and especially when the figures are in more than one color. Brocade is in silk what damask is in wool. Brocatelle, in which cotton and wool are used instead of silk, is an imitation of brocade.

BROCATELLE. See Brocade.

BROCCHI, brŏk'kē, **Giovanni Battista,** Italian mineralogist and geologist: b. Bassano, 18 Feb. 1772; d. Khartum, 25 Sept. 1826. In 1808 his valuable researches on iron mines and metalliferous mountains procured him the office of inspector of mines in the newly established kingdom of Italy. In 1814 he published a work on the structure of the Apennine Range, with an account of the fossils of its strata. He corrected the erroneous view of Brieslak, who supposed Rome to occupy the site of an extinct volcano, to which he ascribed the tufa and other volcanic materials found on the seven hills. Brocchi, on the other hand, satisfactorily showed that they are derived either from Monte Albano or Monte Cimino. Both of these are extinct volcanoes, the first 12 miles, the other still farther, to the north of the city. In 1823 Brocchi sailed for Egypt with the view of exploring the mineral resources of that country. He received a commission from Mehemet Ali to examine his recent conquest of Sennaar, but the climate proved too much for his constitution. His works include ‘Trattato mineralogico e chemico sulle miniere di ferro del departimento del Mella’ (2 vols., 1907); ‘Memoria mineralogica sulla Valle di Fassa nel Tirolo’ (1811); ‘Conchicologia fossile subapennina con osservazioni geologiche’ (2 vols., 1814); ‘Dello stato fisico del suolo di Roma’ (1820).

BROCCOLI, a variety of the cauliflower, hardier and with more color in the flower and leaves. The chief varieties are green, purple and dwarf broccoli. It is inferior in flavor to cauliflower, but serves as a substitute for it when the latter cannot be obtained. See Cauliflower.

BROCHANTITE, brō'shŏn-tit (from Brochant de Villiers, a French mineralogist), an orthorhombic transparent or translucent mineral, with hardness 3.5–4; specific gravity, about 3.90; lustre vitreous, pearly on one cleavage face. It is a basic copper sulphate having the formula $CuSO_4.3Cu(OH)_2$. It much resembles atacamite, like which it occurs in many copper mines, notably in the Urals, in Cornwall, England and in Chile. In the United States its most important localities are in Utah and Arizona.

BROCHS, brŏhs, class of edifices peculiar to Scotland, particularly in the northern counties, including Orkney, Shetland and the Western Isles, more than 300 in all being known. A broch is a hollow circular tower of dry-built masonry, rarely more than 70 or less than 40 feet in total diameter, occasionally at least 50 feet high, and enclosing a circular court or area from 25 to 45 feet in diameter. The wall, which may be from 9 to 20 feet thick, is carried up solid for about 10 feet, except where pierced by the narrow passage giving entrance to the interior court, or where chambers are hollowed within its thickness and opening off the court. Above this height there are horizontal galleries in the wall, each about six feet high and three feet wide, running completely round the tower, except where crossed by the stair giving access to them, and having windows placed above each other, and all looking into the central area. The only external opening is a doorway about five or six feet high, and rarely more than three feet wide. The passage varies from 9 to 18 feet in length, and about four feet from its outer entrance is the door. Many of the brochs are found in naturally strong positions, such as a precipitous eminence, or a promontory projecting into a loch, and further defenses are afforded by ditches and embankments, earthen ramparts and dry stone walls. Hence it is clear that they were intended to serve as places of shelter and defense, for which purpose they are admirably contrived, as they form a series of strongholds that could be reduced only by a regular siege, the inmates being safe against missiles and even against fire, from the height and strength of the walls. Provided with a sufficiency of food, and obtaining water from a well inside the enclosure, the people thus sheltered could hold out for an indefinite time. The relics found in the brochs, like the structures themselves, are Celtic in character, and belong to post-Roman times. The Brochs were probably built as places of refuge from the Scandinavian vikings that for centuries were a scourge to many of the European coasts, but little or nothing of their history is known. The relics include swords, spears, knives, axes and chisels of iron, with rings, bracelets, pins and other articles of bronze or of brass. Numerous articles made of bone and horn are also found, with stone implements, as querns, mortars, pestles, bowls and cups, lamps, etc. Pottery of various kinds is also found. Spinning and weaving were evidently practised by the broch-builders. Agriculture, hunting and fishing furnished subsistence; and animal food was furnished by the stag, roe, reindeer, ox, sheep, goat and pig, as well as by the whale, porpoise, cod, haddock and other denizens of the sea.

BROCK, Sir **Isaac,** English soldier, «the hero of Upper Canada»: b. Guernsey, 6 Oct. 1769; d. Queenston, Canada, 13 Oct. 1812. He was educated at Southampton and Rotterdam, and entered the army as ensign in the 8th regiment in 1785. In 1791 he transferred to the 49th infantry, with which regiment he was afterward principally associated. He served in North Holland in 1799, with distinction at the battle of Egmont-op-Zee. In 1802 he went to Canada at the head of the 49th regiment, returning three years afterward; but in 1806 he was again in North America. In 1810 he was appointed provisional lieutenant-governor and commander of the forces in upper Canada, and in 1811 he became major-general. On the outbreak of the War of 1812 he acted with vigor and promptitude in making the dispositions for the comparatively small forces under his command. In July, Fort Michilimackinac was captured by the British forces, and in the following month Brock compelled the surrender of the American general Hull at Detroit. For these services he was created K.C.B. On 13 Oct. 1812, he was mortally wounded during an American attack on Queenston Heights. His remains, first interred at Fort George, were removed to a monument at Queenston Heights, which however was blown up by a fanatic Irishman on Good Friday 1840. A commanding column, with a statue of Brock, now crowns the heights, and the environs of the battlefield are a public park. There is also a monument to him in Saint Paul's Cathedral, London. Consult Lady Edgar, 'General Brock' (Toronto 1904); and his 'Life and Correspondence' edited by his nephew, F. B. Tupper (London 1847).

BROCK, Sir **Thomas,** English sculptor: b. 1847. He studied with J. H. Foley and finished after the latter's death a number of his works. Among his productions is the Longfellow bust in Westminster Abbey. He is a member of the Royal Academy. He was created K.C.B. in 1911.

BROCKEDON, brŏk'dĕn, **William,** English artist and inventor: b. Devonshire 1787; d. London 1854. He studied at the Royal Academy, London, obtaining a prize for his 'Resurrection of the Widow's Son.' He was the discoverer of a method by which plumbago and its dust (previously thrown away as valueless) could be freed from impurities and resolidified, so as to make a superior description of lead pencils, of various degrees of hardness, well adapted for artists' use. Mr. Brockedon was a painter, and author of 'The Passes of the Alps,' with over 100 folio engravings from drawings by himself. He also produced 'Italy, Classical and Picturesque' (1842–43); and 'Egypt and Nubia' (3 vols., 1846–49).

BROCKEN (*mons Bructerus Melibocus* of the Romans), a mountain in Germany, popularly known as Blocksberg, the highest summit of the Harz Mountains (about 3,745 feet), in the Prussian government of Magdeburg. It was a notable landmark in early history. The bare, treeless summit is covered with snow from November to June; and on it are a hotel and an observatory. Under certain atmospheric conditions the visitor may see a gigantic figure of himself reflected on the clouds (the «Spectre of the Brocken»). According to a popular legend the German witches used to assemble here on Walpurgis Night (q.v.) for an annual orgy. Two well-kept driving-roads lead up the mountain. Many tourists visit the Brocken during the summer, and in clear weather an extensive view may be obtained. The summit is reached by a railway line constructed in 1898.

BROCKENBOROUGH, William H., American jurist: b. about 1813; d. Tallahassee, Fla., June 1850. He received a classical education, studied law, was admitted to the bar and settled in Tallahassee. Although struggling against pulmonary consumption, which eventually caused his death, he held a distinguished position as a citizen. Under the territorial government he was a senator from the western district and at one time president of the senate. He became successively United States attorney for the western district of the territory, a judge of the United States District Court, and representative in Congress, successfully contesting his seat with Edward C. Cabell, and serving from 24 Jan. 1846 to 3 March 1847. On several occasions he was a presidential elector.

BROCKENBOROUGH, William V. American jurist: b. 10 July 1778; d. Richmond, Va., 10 Dec. 1838. He represented Essex County in the legislature and was subsequently a councillor. He became judge of the General Court in 1809, and retained that office until 1834, when he was appointed one of the judges of the Court of Appeals, an office that he retained until his death.

BROCKET (Fr. *broche,* a «spit» or «tine»), a book-name given to Brazilian deer of the sub-genus *Coassus,* because of their spike-like antlers. There are four species, varying in height from 19 to 27 inches, namely: (1) Guazuviva (*Coassus nemorivagus*), or Brazilian deer; (2) Pita (*Coassus rufus*); (3) A similar form, the pudu (*Pudua humilis*) of the Chilean Andes, the smallest of all deer, having spike horns only about two inches long.

BROCKHAUS, brŏk'hows, **Friedrich Arnold,** German publisher, founder of the publishing firm of Brockhaus in Leipzig: b. Dortmund, 4 May 1772; d. Leipzig, 20 Aug. 1823. He was educated at the gymnasium of his native town, and in 1793 went to Leipzig, where he devoted two years to the acquisition of scientific knowledge and the principal modern languages of Europe. In 1795 he established at Dortmund a mercantile house for the sale of English manufactures, which he removed to Arnheim, in the Netherlands, in 1801, and to Amsterdam in 1802. Although he managed his business with success, he abandoned it out of distaste for mercantile pursuits in 1804, and entered into the book trade at Amsterdam. After the annexation of Holland to the French empire (1810), Brockhaus returned to Germany, and reopened his establishment in Altenburg (1811). In 1813 the firm received the title of F. A. Brockhaus. In 1808 Brockhaus had purchased the copyright of the German 'Konversations-Lexikon,' which had been begun in 1796. In 1809–10 he completed the 1st edition by the publication of two supplementary volumes. In 1812 he began to publish the second edition of this work, which was finished under his own editorship. It was favorably received and had an extensive sale. The business now rapidly extended, and was removed to Leipzig in 1817. It still is carried on by the grandsons of the founder, and there are now chief branches in Berlin and Vienna. Among the literary undertakings of the house have been several important critical periodicals and some large historical and bibliographical works, notably Ersch and Gruber's 'Allgemeine Enzyklopädie' (167 vols. since 1818, incomplete). The 'Konversations-Lexikon,' distinctively associated with the name of Brockhaus, has now reached a 14th edition. The 5th edition of the 'Kleines Konversations-Lexikon' appeared in 1910 (2 vols). Consult Brockhaus, H. E., 'F. A. B., sein Leben und

Wirken’ (3 vols., Leipzig, 1872–81); and the same author’s ‘Die Firma F. A. B. von der Begründung bis zum hundertjährigen Jubiläum, 1805–1905’ (Leipzig 1905).

BROCKHAUS, Hermann, German Orientalist, third son of F. A. Brockhaus: b. Amsterdam, 28 Jan. 1806: d. Leipzig, 5 Jan. 1877. He was educated at Amsterdam and at Göttingen and Bonn, where he devoted himself to Oriental languages. He lived for a long time in France and England and then settled in Dresden. In 1839 he went as professor to Jena, and in 1841 to Leipzig, where, in 1848, he became professor of Sanskrit, a position he held until his death. He published many works on Oriental literature, including the first five books of the great collection of fairy tales of Somadeva, ‘Kathãsaritsãgara’ (“The Ocean of the Flow of Story”) (1839–66); an edition (1845) of the play ‘Prabodhachandrodaya’ (“The Rise of the Moon of Intelligence”) of Krishna Miśra; and a critical edition of ‘Lieder des Hãfis’ (3 vols., 1854–60). In 1841, he proposed the plan of printing Sanskrit words in the Latin alphabet and he did much in other ways to increase knowledge of and interest in Oriental languages. He prepared the first European glossary of the Avestan language, which was appended to an edition of Vendidãd Sãde (Leipzig 1850). In 1856 he became editor of the great ‘Allgemeine Enzyklopädie’ of Ersch and Gruber. In 1853, he founded the *Zeitschrift der deutschen morgenländischen Gesellschaft,* in which he published numerous articles on the Orient.

BROCKPORT, N. Y., village of Monroe County, 20 miles west of Rochester, on the Barge Canal, the New York Central and Hudson River Railroad. A State normal school is located here. The village has important agricultural and fruit-growing interests and contains manufactories of canned goods, shoes, pianos, clocks, gloves, tractors and spraying machines. The waterworks are village property. Pop. (1920) 2,930.

BROCKTON, Mass., a city in Plymouth County, situated on the New York, New Haven & Hartford Railroad, 20 miles south of Boston. It is one of the largest boot and shoe manufacturing places in the country, the value of the annual output in this industry reaching a total of $60,000,000, and besides these articles has extensive manufactories of rubber goods, shoe machinery and supplies, tools and bicycles. The United States Census of Manufactures for 1914 recorded 243 industrial establishments of factory grade, employing 18,278 persons, of whom 16,246 were wage earners, receiving annually $10,557,000 in wages. The capital invested aggregated $28,809,000, and the year’s output was valued at $51,259,000; of this, $19,595,000 was added by manufacture. It contains the villages of Campello, Montello, Marshall’s Corner, Brockton Heights, Clifton Heights and Salisbury Square. It was settled in 1700, was incorporated as a town in 1821 and chartered as a city in 1881. The government is vested in a mayor, elected annually, and a bicameral city council. There are two national, two savings banks, three co-operative, one Morris plan and one Trust company, a public library, with over 70,000 volumes; public school property valued at over $1,000,000; and a property valuation of $54,339,716. Pop. (1920) 66,254.

BROCKVILLE, Canada, town in Leeds County, Ontario, on the left bank of the Saint Lawrence below the Thousand Islands, 125 miles southwest of Montreal, on the Grand Trunk, Canadian Pacific and Canadian Northern railways. It possesses excellent wharfage accommodation, and has important manufactories, including automobiles, agricultural implements, engines and motor boats, and the making of biscuits and confectionery. The town has 14 churches, hospitals, library and excellent schools and public parks. Pop. 9,374.

BRODEUR, brō-dėr′, **Louis Philippe,** Canadian statesman: b. Beloeil, Quebec, 21 Aug. 1862. He was educated at the College of Saint Hyacinthe and Laval University, and was called to the bar in 1884. He was first returned to the House of Commons in 1891, and became editor of *Le Soir* in 1896. He was speaker of the House of Commons, 1896–1900, 1900–04; Minister of Inland Revenue, 1904–06; Minister of Marine and Fisheries, 1906–11; and has been judge of the Supreme Court of Canada since the latter year. He was member of the Imperial Conferences of 1907 and 1911; assisted in negotiating the Franco-Canadian Treaty of 1907, and was the author of the first naval bill introduced into the Canadian Parliament.

BRODIÆA, brō-dĭ-ē′ą, a small genus of western American corm-rooted plants of the family *Liliaceæ,* some of which are popular as garden flowers. The species are of low growth, and have several purple, red, white or yellow funnel-shaped flowers on a scape. For list of species and cultural directions consult Bailey, ‘Standard Cyclopedia of Horticulture’ (New York 1914).

BRODIE, Alexander Oswald, American soldier and administrator: b. Saint Lawrence County, N. Y., 13 Nov. 1849; d. 10 May 1918; graduated, West Point, 1st lieutenant of cavalry, 1875–77, then resigned to take up cattle ranching in Kansas, and mining and engineering later in Arizona. He served in two Indian campaigns in 1883 and 1884; and during the Spanish-American War as major in Colonel Roosevelt’s ‘Rough Riders,’ fighting in Cuba and elsewhere, being wounded and promoted lieutenant-colonel. He was acting governor of Arizona in 1902; in 1905 became assistant chief of the Record and Pension Office, then military secretary, in 1907 lieutenant-colonel adjutant-general; colonel in 1912, and retired into private life 1913.

BRODIE, Sir **Benjamin Collins,** English surgeon: b. Winterslow, Wiltshire, 9 June 1873; d. Broome Park, Surrey, 21 Oct. 1862. His father superintended his education till he was 18, after which he went to the Hunterian School of Anatomy. In 1803 he became a pupil of Sir Everard Home at Saint George’s Hospital, and in 1805 was appointed assistant to Mr. Wilson, demonstrator of anatomy. In 1809 he became a lecturer of the school and assistant surgeon of the hospital. In 1810 he was elected Croonian lecturer to the Royal Society, and the excellence of his papers caused him to be elected a fellow, and in the following year he received the Copley medal. His reputation as a distinguished surgeon was now established, and his professional career became one of uniform success. From 1819 to 1823 he was professor of anatomy at the Royal College of Surgeons. In 1822 he was elected a full surgeon at Saint George's. He continued giving clinical lectures there till 1830, when the increasing demands of his profession compelled him to discontinue them. In 1832 he succeeded Sir Everard Home as sergeant-surgeon to William IV, and was made a baronet by patent in 1834. Queen Victoria continued him in the same appointment. From 1835 to 1846 he was a member of the Court of Examiners of the College of Surgeons, and in 1844 he was president of the court. In 1858 he was elected president of the Royal Society, which honor he held till 1861. For some years before his death his sight failed, and for about two years he was almost totally blind. As a professional practitioner his gains exceeded those of almost any man of like profession in his time. In 1851 he republished a selection of his earlier essays, entitled ‹Physiological Researches.› His work on ‹Pathological and Surgical Observations on Diseases of the Joints› (1818) was esteemed of great value both in Great Britain and on the Continent, and went through many editions. In 1854 he published a work in a colloquial form entitled ‹Psychological Inquiries.› The dialogue is not controversial, and the work contains the mature opinions of the author on various speculative subjects.

BRODRICK, George Charles, English educator: b. Castle Rising, Norfolk, England, 5 May 1831; d. 14 Sept. 1903. He was educated at Eton and Balliol College, Oxford, and University of London. He was called to the bar in 1859. From 1877–79 he was a member of the London School Board. In 1881 he became warden of Merton College. Among his works are ‹Political Studies›; ‹English Land and English Landlords›; ‹Memorials of Merton College›; ‹Short History of Oxford University›; and ‹Memories and Impressions.›

BRODRICK, William St. John Freemantle, 9th viscount Middleton, English statesman: b. 14 Dec. 1856. He was educated at Eton and at Balliol College, Oxford. From 1880–85 he was member of Parliament for West Surrey; 1886–92, financial secretary to the War Office; 1895–98, Under-secretary of State for War; 1898–1900, Under-secretary of State for Foreign Affairs; after becoming Secretary for War. His administration of the War Office during the South African War was severely criticized. He became Secretary of State for India in 1903, and supported Kitchener against Lord Curzon, which led the latter to resign in 1905. From 1907 to 1913 he served as alderman of the London county council. In 1907 he succeeded his father as Viscount Middleton.

BRODSKY, Adolf, Russian violinist: b. Taganrog, South Russia, 21 Feb. 1851. He first played in public at the age of nine, and later went to Vienna to pursue his musical studies. In 1879 he became director of the symphony concerts in Kieff, and later held a professorship in the Leipzig Conservatory. As a soloist he appeared in concerts in several of the leading cities of Europe. He came to the United States in 1891 and taught for a time in Scharwenka's Conservatory, New York, but returned to Leipzig. In 1895 he was made director of the Royal College of Music, Manchester, England. In 1881–82 he made successful concert tours of England, Paris, Moscow and Vienna.

BRODY, Poland, town in Galicia, near the Russian frontier, 58 miles east-northeast of Lemberg, on a swampy plain. It has broad streets, houses mostly built of stone, an old castle, three churches, Jewish synagogue, etc. About two-thirds of its inhabitants are Jews, who have a hospital for themselves and a college for the instruction of artists and mechanics. The commerce, carried on principally by Jews, is important, the town being favorably situated for the interchange of goods between Austria and Russia, and Turkey. Grain, wool, cattle, fur, feathers and agricultural implements are the principal items of trade. Pop. about 14,000.

BRODZINSKI, brŏd-zēn'skē, **Kazimierz,** Polish soldier and national poet: b. Krolowko 1791; d. Dresden, 10 Oct. 1835. In early life he was engaged in active military service, and in 1813 during Napoleon's campaign in Germany, he was taken prisoner at the battle of Leipzig. In his idyllic narrative poem ‹Wieslaw,› he reinvigorated Polish verse from national sources and becoming known for his familiarity with the world's literature received the appointment of professor of æsthetics and literature in the newly established university of Warsaw. He translated many of the masterpieces of European literature into Polish, notably Scott's novels in 10 volumes. His own writings were published in eight volumes (Warsaw 1872–74). Consult Arabazhin, ‹Kazimierz Brodzinski› (Kiev 1891).

BROGLIE, brō-lē, a family distinguished in the annals of French wars and diplomacy, which derives its origin from Piedmont. Among its members are:

1. François Marie, Duc de, French soldier: b. Paris, 11 Jan. 1671; d. Ferrières, 22 May 1745. From 1689 he fought with distinction in the Netherlands, Germany and Italy. He was also employed in diplomatic affairs, and concluded a treaty between France, England and Prussia in 1725. He rose by degrees till in 1734 he became marshal of France. In the war of the Austrian succession he had the chief command of the armies in Bavaria and Bohemia.

2. Victor François, Duc de, French soldier: b. (the eldest son of the preceding), 19 Oct. 1718; d. Münster 1804. He commenced his career under his father in the battles of Guastalla and Parma (1734); was engaged in all the wars of France, and was created marshal in 1759. Jomini considered him the only French general who had shown constant ability during the Seven Years' War. He was engaged in the battles of Hastenbeck, Rossbach, Sondershausen and Lützelberg, and, being appointed to the chief command, defeated the Prussians and Hessians at Bergen in 1759, for which Francis I of Austria created him a prince of the empire. In 1760 he gained another victory at Corbach, but was defeated,

together with the Prince of Soubise, at Willingshausen, in the following year. In consequence of this and the favor of Soubise at court he was exiled. He was recalled in 1764, and in 1789, when the Revolution broke out, Louis XVI appointed him Minister of War; at the same time he received the command of the troops that were to keep Paris in check. The desertion of the National Guard rendered all his efforts vain, and Broglie left France. In the campaign of 1792 he commanded a division of the *émigrés* without success. After its close he withdrew entirely from public life.

3. Victor Claude, Prince de Broglie, French soldier: b. (third son of the preceding), 1757; d. Paris, 27 June 1794. He entered at first into the views of the revolutionary party. He was deputy of the nobility of Colmar to the States-General in 1789. After the dissolution of the Constituent Assembly he was appointed field-marshal in the army of the Rhine, but upon his refusal to acknowledge the decree of 10 August, suspending the royal authority, was deprived of his command, summoned before the revolutionary tribunal, and led to the guillotine.

4. Achille Charles Léonce Victor, Duc de, French statesman: b. Paris (son of the preceding), 1 Dec. 1785; d. Paris, 25 Jan. 1870. In 1816 he married a daughter of Madame de Staël and was made a member of the Chamber of Peers. After the Revolution of 1830 the Duc de Broglie and Guizot were the heads of the party known as *doctrinaires.* He was Minister of Public Instruction for a short time in 1830, and Minister of Foreign Affairs from October 1832 to April 1834. In 1849 he was a Conservative member of the Legislative Assembly, and after the *coup d'état* he continued a bitter enemy of the imperial régime. His later years were devoted to philosophical and literary pursuits.

5. Jacques Victor Albert, Duc de: b. Paris (son of the preceding), 13 June 1821; d. 1901. In 1846 he became secretary to the embassy at Madrid, when he was transferred to that at Rome, but the revolution of 1848 caused him to give up public life. From that time he became known as an able writer in political reviews. In 1856 he published ‘L'Histoire de l'Eglise et de l'Empire,’ in six volumes, a work which gained him a chair in the Academy. In 1871 he was elected to the National Assembly for the department of Eure, and in the same year became Ambassador at London. He led the opposition to Thiers during 1872–73, and finally succeeded in defeating him. In the latter year he became Minister of Foreign Affairs and president of the council, but in 1874 he suffered defeat. In 1885 he again gave up political life and devoted himself to his historical studies. Among his works are ‘Le Secret du Roi Louis XV’ (1878); ‘Frédéric II et Marie-Thérèse’ (1883); ‘Maurice de Saxe et le Marquis d'Argenson’ (1891); ‘La Paix d'Aix-la-Chapelle’ (1892); ‘Le Père Lacordaire’ (1895); ‘Malherbe’ (1897), etc.

BROGNY, brōn-yē, **Jean Allarmet,** Italian cardinal: b. Brogny, near Annecy, Savoy, 1342; d. Rome, 16 Feb. 1426. Although a swineherd in his youth, he attained, by his learning and virtues, a position of great influence and eminence in the Church. He was successively made bishop of Viviers, of Ostia, archbishop of Arles, and bishop of Geneva, and finally cardinal and chancellor of the Church of Rome. During the great schism which divided the Church for more than 40 years Brogny devoted himself to the work of conciliation. The Council of Constance being called for that purpose by John XXIII and the Emperor Sigismund, the former was deposed at the sixth session, after which Brogny presided as senior cardinal until the 41st, when Cardinal Colonna was elected Pope, 14 Nov. 1417, chiefly through Brogny's influence, under the name of Martin V, and the holy see was once more established at Rome. As president of the Council of Constance he had to pronounce the sentence of death upon Huss, to whom he had shown great kindness during the trial, having visited him several times in his prison and exhorted him, but in vain, to save his life by recanting his creed. The cardinal was the founder of the hospital of Annecy, and of the College of Saint Nicolas at Avignon to which he left his library and manuscripts. Consult Besson, ‘Mémoires pour l'histoire ecclesiastique des diocèses de Savoie (Annecy (Nancy) 1759).

BROGUE, brōg (Ir. and Gael. *brog*), a coarse and light kind of shoe made of raw or half-tanned leather, of one entire piece, and gathered round the foot by a thong, formerly worn in Ireland and the Highlands of Scotland. The term is also used of the mode of pronunciation peculiar to the Irish, but whether the word in this sense is the same as in the other is doubtful.

BROILING, the cooking of meat or fish on a gridiron above a fire, or by laying it directly on the coals, a very wholesome method of cookery. See Cookery.

BROKE, Sir **Philip Bowes Vere,** British admiral: b. Ipswich, 9 Sept. 1776; d. 2 Jan. 1841. He entered the navy in 1792, and, after he had seen much active service, distinguished himself in 1813 as commander of the frigate *Shannon,* in the memorable action which that vessel, in answer to a regular challenge, fought with the *Chesapeake* off the American coast. The *Shannon,* carrying 38 guns and 330 men, in an engagement of only 5 minutes, boarded and captured the *Chesapeake,* carrying 49 guns and 440 men. Sir Philip, who was severely wounded in the action, was immediately made a baronet, and in 1815 Knight Commander of the Bath. He became rear-admiral in 1830. Consult Brighton, ‘Memoir of Admiral Sir P. B. V. Broke’ (2 vols., London 1866).

BROKEN ARROW, Okla., city in Tulsa County, 18 miles southeast of Tulsa and 37 miles northeast of Muskogee, on the Missouri, Kansas and Texas Railroad. It has a public school and a high school affiliated with the State University, a city hall and seven churches. Its three banks have a capital and surplus aggregating $200,000, with deposits amounting to $950,000. The value of the city's taxable property amounts to $1,250,000. The industries comprise cotton gins, grain elevators, an ice plant, machine shops and an ice cream factory. The city has an electric-light plant, waterworks valued at $110,000 and a sewer system valued at $35,000. In 1917 municipal receipts totaled $15,000 and the expenditures

$13,850. The bonded debt consists of $22,500 for schools, $70,000 for water supply system and $30,000 for sewers. The city is surrounded by a splendid agricultural region, producing corn, oats, cotton, wheat and potatoes. There are also coal mines and oil and gas wells in the vicinity. Pop. 2,000.

BROKEN BOW, Neb., city and county-seat of Custer County, 80 miles distant from Grand Island, on the Chicago, Burlington and Quincy Railroad. It has farming and stock-raising interests, bottling establishments and a creamery. The municipality owns the waterworks. Pop. (1920) 2,567.

BROKEN HILL, Australia, a mining town in the western part of New South Wales, south of Stanley Range, about 925 miles northwest of Sydney. The town is built on a ridge 150 feet above the plain. It stands in a district which contains many silver mines; and asbestos, lead, gold, copper, etc., are also found here. One of the silver mines, the Proprietary, is the most productive in the world. It is connected with Silverton and Adelaide by rail. Pop. 30,500.

BROKEN-WIND, a disease in horses. See HEAVES.

BROKER (Lat. *abrocator,* perhaps from the Saxon *abroccan,* to break up, from which is derived "abbroachment," the breaking up of goods or selling at retail). The early use of this term designated a retailer of goods, generally supposed to belong to another person, and hence applied to any one making a bargain as the agent of another for the sale or purchase of goods. The distinctive character of a broker was that he acted in behalf of another and in his name; at least, when the contract came to be consummated, the name of the principal was in the ordinary course disclosed. It was a further incident of a broker's employment that he did not have possession of the goods sold, or receive possession of the goods purchased, in which respect he differed from a factor. And these principles still apply. But the office of broker has been vastly extended by the increasing exigencies of commercial business.

The most important kinds of brokers are here enumerated. Bill and note brokers negotiate the purchase and sale of bills of exchange and promissory notes. They are paid a commission by the seller, and it is not their custom to disclose the names of their principals. There is an implied warranty that what they sell is what they represent it to be, and should a bill or note sold by them turn out to be a forgery, they are held to be responsible; but it would appear that by showing a payment over to their principals, or other special circumstances attending the transaction proving that it would be inequitable to hold them responsible, they will be discharged. (Edwards, Bills, 291; 4 Duer, 79). The authorities, however, are not in harmony upon this question. (Consult 3 Allen 258; 1 Hill 287; 21 E. C. L. 379). Exchange brokers negotiate bills of exchange drawn on foreign countries, or on other places in this country. It is sometimes part of the business of exchange brokers to buy and sell uncurrent bank notes and gold and silver coins, as well as drafts and checks drawn or payable in other cities; although, as they do this at their own risk and for their own profit, it is difficult to see the reason for calling them brokers. Insurance brokers procure insurance, and negotiate between insurers and insured. Merchandise brokers negotiate the sale of merchandise without having the possession or control of it, as factors have. Pawnbrokers lend money in small sums, on the security of personal property, at usurious rates of interest. They are licensed by the authorities, and excepted from the operation of the usury laws. Real estate brokers are those who negotiate the sale or purchase of real property. They are a numerous class, and, in addition to the above duty, sometimes procure loans on mortgage security, collect rents and attend to the letting and leasing of houses and lands. Ship brokers negotiate the purchase and sale of ships and the business of freighting vessels. Like other brokers they receive a commission from the seller only. Stock brokers are those employed to buy and sell stock in incorporated companies. The stock brokers are associated together in the larger cities under the name of the Board of Brokers. (See EXCHANGE). This board is an association, admission to membership in which is guarded with jealous care. Membership is forfeited for default in carrying out contracts, and rules are prescribed for the conduct of the business, which are enforced on all members. The purchases and sales are made at sessions of the Board, and are all officially recorded and published by an officer of the Association. Stock brokers charge commission to both buyers and sellers of stocks.

BROMAL HYDRATE is prepared by adding bromine to iced achohol, distilling and combining with water. Its crystals resemble those of chloral hydrate in appearance and chemical properties, and are soluble in water. The drug has a sedative action tending to produce sleep, and is employed in nervous conditions and to diminish the attacks in epilepsy. It has little effect on pain, and should not be used when the heart is weak or the stomach upset.

BROMAMIDE, a volatile crystalline substance without odor or taste and containing bromine. It is insoluble in water and is employed as a sedative in acute and chronic rheumatism and neuralgia.

BROMBERG, brŏm-bãrH, Poland, town in the province of Posen, 69 miles northeast of the city of that name; situated on the Brahe six miles west of its confluence with the Vistula. It is an important trading centre in coal, lumber, flour, leather and wool. It manufactures soap, candles, furniture and snuff and contains breweries and distilleries, iron foundries and dyeing establishments. It was added to Prussia in 1772 and returned to Poland after the World War. It has two Protestant and two Roman Catholic churches, a synagogue, asylum for the blind, a gymnasium and a real-gymnasium. Pop. about 58,000.

BROME, Richard, English dramatist: d. about 1652. He was at first the servant and afterward the friend of Ben Jonson, who encouraged him in his literary work, and on whose style his plays are modeled. The best and most popular of his dramas, some of them comedies dealing with the everyday life of his time and others of a more romantic character, are ‘The Court Beggar’ (acted 1632); ‘The Love-sick Court’ (published 1659); ‘The Queen and Concubine’ (published 1659); ‘The Northern Lass’ (printed 1632); ‘The Sparagus Garden’ (acted 1635); ‘The Antipodes’ (acted 1638), and ‘A Jovial Crew’ (acted 1641).

BROME-GRASS, the common name of the genus *Bromus.* About 100 species are known, occurring in both the Old and the New World. These grasses have great power of resisting drought, and have proved themselves valuable forage plants on the high, dry plains of the western United States. Some species are cultivated for hay in the Eastern States, but are not much relished by cattle. One species is known as cheat or chess, and is found in wheat-fields. Several others have become naturalized in the United States, especially on the Pacific Coast, and are often troublesome weeds.

BROMELIA, a genus of about 25 species of monocotyledonous, stemless herbs of the natural order *Bromeliaceæ,* natives of tropical America, introduced into other warm climates for the sake of the fibre obtained from their leaves, and cultivated in greenhouses to some extent for ornament. The species have stiff leaves like the pineapple and flowers in panicles. *B. pinguin,* the wild pineapple or pinguin, a native of the West Indies, is perhaps best known because of its use as a tropical hedge-plant, for which its numerous sword-shaped, spiny, rigid leaves, three to six feet long, and two inches wide, specially adapt it. The leaves are also ornamental, being bright green at first and turning red with age. The reddish pubescent flowers in compact panicles are followed by edible fruits as large as plums. These fruits are used to make a pleasant cooling drink. *B. sylvestris,* which has smaller leaves, furnishes a fibre said to be superior to the preceding species. Other species also yield a fibre of greater or less value. The genus was named after the Swedish botanist Bromel.

BROMIC ACID ($HBrO_3$), a monobasic colorless acid, forming salts called bromates. It was discovered by Balard in 1826. When bromine is dissolved in caustic potash a mixture of bromide and bromate of potassium is obtained, which can be separated by crystallization, $3Br_2 + 6KHO = 5KBr + KBrO_3 + 3H_2O$. Free bromic acid can be prepared by passing chlorine into bromine water, $2Br + 10Cl + 6H_2O = 2HBrO_3 + 10HCl$. The acid is best obtained by decomposing potassium bromate by argentic nitrate, and acting on the resulting argentic bromate by bromine, $5AgBrO_3 + 3Br_2 + 3H_2O = 5AgBr + 6HBrO_3$. Bromic acid is a strongly acid liquid, reddening and then bleaching litmus paper. On concentration at 100° it decomposes into bromine and oxygen. It is decomposed by sulphur dioxide (SO_2), by sulphide of hydrogen (H_2S), and by hydro-bromic acid (HBr). Bromates are with difficulty soluble in water, and are decomposed on heating into oxygen and bromides. When combined with sulphur or charcoal the bromides may be exploded by percussion.

BROMIDE, brō′mīd, a combination of bromine with a metal or a radical. Bromides are soluble in water, except silver and mercurous bromides; lead bromide is very slightly soluble. They are detected in analysis by the following reactions: Argentic nitrate gives a yellowish precipitate of $AgBr$, insoluble in dilute nitric acid, and soluble in strong ammonia. Chlorine liberates bromine, and, if the liquid is shaken up with ether, a yellow ethereal solution floats on the liquid. Heated with sulphuric acid and MnO_2, bromides yield vapors of Br, which turn starch yellow. Potassium bromide (KBr) is one of the most important of the bromides, being extensively used in medicine as a sedative. It is formed by the addition of bromine to a solution of potassium hydroxide; the residue is evaporated and heated with some charcoal. The bromide is next purified by re-crystallization from water. It is colorless, and has a pungent saline taste. Sodium bromide is also used extensively in medicine and is said to cause less disturbance in the alimentary tract than potassium bromide. Silver bromide is made by adding silver nitrate to an aqueous solution of another metallic bromide. It is much used in photography because of its sensitiveness to light. Ammonium bromide, lithium bromide, calcium bromide and zinc bromide are also used in medicine and have special applications; their prolonged use, however, is attended with injurious effects generally termed *bromism,* and consisting of a rash, mental dullness and general loss of nervous power.

BROMIDROSIS (bromos, a bad odor — hidros, sweat), malodorous perspiration usually excessive in quantity and due mostly to bacterial decomposition of the sweat. The parts most effected are the armpits and the feet, but the latter are not attacked in persons who go barefoot. The victims are mostly anæmic, nervous persons. Very hot water, formaldehyde, salicylic acid and boric acid are the most used applications, the latter being dusted in shoes and stockings. The sweat also sometimes smells of certain odoriferous substances not necessarily offensive, which have been taken; for example: asafœtida, copaiba, benzoic acid, musk, onion or garlic. It also may develop a peculiar odor in cholera, smallpox or typhoid fever, and smell of urine in uræmia. Rarely it gives a pleasant odor of violet or pineapple. The sweat in some colored races has a distinctive, unpleasant smell.

BROMINE, a non-metallic element. Symbol Br; atomic weight, 79.4 for $H = 1$, or 80.0 for $0 = 16$. Bromine was discovered in 1826 by Balard, in the salts obtained by the evaporation of sea water. Bromine is not found in an uncombined form in nature but exists as a constituent in all sea water and in most mineral waters and salt springs. It is liberated from its sodium and magnesium salts by the action of free chlorine, and is separated by ether, which dissolves the bromine. This red-colored solution is removed, saturated with potash, evaporated and heated to redness, and the bromide of potassium is heated with manganese dioxide and sulphuric acid. The bromine is liberated in the form of a deep red vapor, which condenses into a dark, reddish-black liquid, which is mobile, and volatile, and has a specific gravity of 2.97. It boils at 63°, and its vapor density is 5.54 times that of air. It has an irritating smell, and when inhaled is poisonous. On account of this poisonous quality and the great vapor density it was used largely in the making of the asphyxiating gases employed in the European War (see Bombs). It dissolves in 30 parts of water, and the solution has weak bleaching properties. Bromine and hydrogen do not unite in the sunlight, but do when they are passed through a red-hot porcelain tube, forming hydrobromic acid (HBr), which is also obtained by the action of phosphorus and water on bromine. It is a colorless, fuming gas, which liquefies at 73°, very soluble in water. The concentrated solution contains 47.8 per cent of HBr; it boils at 126°, and has powerful acid properties; it neutralizes bases, forming bromides and water. Hypobromous acid, $HBrO$, is only known in solutions; it has bleaching properties. Bromine can displace chlorine from its compounds with oxygen, while chlorine can liberate bromine from its compounds with hydrogen. Free bromine turns starch yellow.

In the arts bromine is used in very large quantities in making the sensitive silver salts employed in photography. It is also used to dissolve gold in metallurgical processes, and in the manufacture of dyes and disinfectants. In medicine bromine has been applied externally as a caustic but rarely. Its chief officinal preparations are bromide of ammonium, useful in whooping-cough, infantile convulsions and nervous diseases generally; and bromide of potassium, very extensively used as a depressant of the nervous system, especially in epilepsy, hysteria, delirium tremens, diseases of the throat and larynx, bronchocele, enlarged spleen, hypertrophy of liver, fibroid tumors, etc. Also, as an antaphrodisiac, for sleeplessness, glandular swellings and skin diseases. The alterative properties of bromide of potassium are similar to, but less marked than, those of the iodides. Its preparation is the same as iodide of potassium, substituting an equivalent quantity of bromine for iodine — $6KHO + Br_6 = 5KBr + KBrO_3 + 3H_2O$. It has a pungent saline taste, no odor and occurs in colorless cubic crystals, closely resembling the iodide. As a hypnotic its usefulness is much increased by combining it with morphia or chloral hydrate. Bromine is manufactured chiefly from the mother liquors of saltworks. In the United States the largest production comes from the natural brines of the salt wells of Michigan. Other localities of note are Pomeroy, Ohio, and a few points in West Virginia. Previous to the outbreak of the European War the Michigan and Ohio product was manufactured into fine chemicals, the average amount produced annually being about 600,000 pounds, and the average price about 20 cents per pound. By 1915 the output had been placed on the market largely in crude form, and the amount totaled 855,857 pounds, the price rapidly advancing to as high as $6.50 per pound in the early part of 1916. The demand from abroad decreasing, the output for 1916 fell to 688,260 pounds, for which an average price of $1.34 per pound was obtained, aggregating a value of $922,225. See Mineral Productions of the United States.

BROMIPIN, a yellow, bland liquid of simple oily taste, and composed of oil of sesame with 10 per cent of bromine. It is easily borne by the stomach and does not readily produce bromism, therefore in some cases it is substituted for the bromides which it resembles in its action on the nervous system.

BROMISM, a condition which results from the accumulation of bromides in the system, owing to the ingestion of greater quantities than the body can get rid of. The breath is fetid, the skin breaks out in an acne eruption, the throat is insensitive to touch so that it may be tickled with a feather, and there is loss of memory, heaviness of intellect, great sleepiness and depression of spirits. If the drug is still continued there may be paralysis, loss of sight and hearing, inability to speak above a whisper and various symptoms of mental derangement. The symptoms usually quickly subside on stopping the drug.

BROMLEY, England, town of Kent, 10 miles south-southeast of London. It has a market square with a large market-house, and has rapidly increased by the erection, in its vicinity, of large groups of houses occupied by London merchants. The most notable place of worship is the church of Saint Peter and Saint Paul, which retains a Norman font and other remains of an earlier church. It possesses a chalybeate spring that was in high repute prior to the Reformation, and has a charitable foundation for the widows of clergymen. Pop. 33,646.

BROMOFORM, a clear, heavy, volatile liquid of ethereal odor and sweetish taste, soluble in alcohol or ether though not in water. It is analogous to iodoform and chloroform, and is made like the latter from alcohol or acetone. It is somewhat anæsthetic and has been used like chloroform, but its special use is in «whooping-cough,» in which a few drops are given in solution or mixture several times a day.

BROMOL, the precipitate formed when bromine water is added to a solution of carbolic acid. It occurs in crystals, is antiseptic, and may be taken internally for diarrhœa or cholera morbus, or applied to wounds or ulcers in the form of a salve.

BROMPTON, England, a suburban district of London, in Kensington, associated with the names of Burke, Canning and other eminent men. The oratory of Saint Philip Neri, the Victoria and Albert Museum, the Brompton Consumption Hospital and the West London cemetery are included in this district.

BROMUS. See Brome-Grass.

BRONCHI, brong'ki, the twin branches into which the trachea or windpipe divides in the chest, one going to the right lung, the other to the left, and ramifying into innumerable smaller tubes — the bronchial tubes. See Lungs.

BRONCHITIS (Gk. *bronchia*, the bronchial tubes + itis, a suffix denoting inflammation), inflammation and catarrh of the bronchi. It occurs in various forms in each of which the bronchitis may be acute or chronic. It may also as acute or chronic be a primary condition, known as non-specific, or secondary specific. The former results from exposure to chemical or mechanical irritation, sudden change to lower temperature, inhalation of dust, particularly dust containing vegetable organisms and probably bacterial agents; the latter is due to the micro-organisms of other specific infectious diseases as measles, diphtheria, etc. It may also occur in other severe disease forms from the chemical or organic irritants deposited in the mouth and pharynx from which they find their way into the bronchi. Lessened resistance power in other diseases also predisposes to bronchitis. Acute bronchitis is frequently an exacerbation of the chronic condition, while again chronic bronchitis may develop from an acute attack.

The disease is particularly common in young children and in the aged with both of whom it assumes a serious form and often proves fatal. It is more common with men than with women since it is frequently due to occupational exposure.

The acute attack may be very slight, lasting only a day or two, but the usual duration is one or two weeks. Complete return to health may be long delayed. In a protracted course there may be frequent remissions and exacerbations depending upon the season and other external factors. Pneumonia may develop following an attack of bronchitis or the chronic form may lead to chronic symptoms in the respiratory organs or the heart. The symptoms of an attack are cough and mucopurulent expectoration. The cough may be dry for a day or two but this is followed by an abundant secretion or a scanty and viscid expectoration. Dyspnœa is also present in the severer forms. In the milder forms the inflammation is limited to the larger bronchi. In other cases the symptoms are more marked and there is fever for several days or for one or two weeks. Capillary bronchitis or bronchitis of the finest bronchi is found usually as a primary condition only in children, especially in weak and ill-nourished children. In adults it may develop, however, as a secondary bronchitis in connection with other severe disease. There may be also a putrid or fetid bronchitis distinguished by the foul putrid character of the expectoration due to a decomposition of the mucous membrane. A rare form is a croupous bronchitis in which there is a formation of extensive fibrinous patches in the bronchi which give rise to membranous casts in the expectoration. Aside from the treatment of the fever in the acute condition and the use of expectorants the treatment consists largely of warmth, light diet, warm diluent drinks, diaphoretic baths and inhalations. Prophylactic treatment for those subject to exacerbations of the chronic condition consists of seasonal change of climate and avoidance of external irritating conditions, with a moderate diet. Consult Allbutt's ‘System of Medicine’; Osler's ‘Principles and Practice of Medicine’; and Strümpell's ‘Textbook of Medicine.’

Smith Ely Jelliffe.

BRONCHOCELE, brŏng'kō-sēl, an indolent tumor on the forepart of the neck, caused by enlargement of the thyroid gland, and attended by protrusion of the eyeballs, anæmia and palpitation.

BRONCHOTOMY, brŏng-kŏt'ō-mĭ, in surgery, an incision into the windpipe or larnyx, between the rings, to afford a passage for the air into and out of the lungs when any disease prevents respiration in the usual way, or to extract foreign bodies which have got into the trachea, or in cases of suffocation, drowning, etc. It is known as tracheotomy or laryngotomy, according as the windpipe or the larynx is operated on.

BRONCO, or **BRONCHO,** the small horse of the plains in western United States and in Mexico. In Texas it is called «Mustang.» It is descended from the horses of Arabian stock, brought to America by the early Spaniards, and exhibits still certain Arabian features due to this ancestry. Many of the Spanish horses were captured by the Indians, and some escaped from their owners. Of the former, great numbers deserted their Indian captors and roamed with their free companions over the plains of the Southwest, where they multiplied rapidly and adapted themselves to the local conditions of climate and vegetation. Thus they returned to a wild state in this country, which has been considered as the original habitat of the horse family, but which presents nowhere, unless on the pampas of South America, an aboriginal type of horse. These wild horses have more recently been captured and bred in captivity, and have been modified by admixture of blood with horses from the eastern United States. They are famous for their endurance, despite their rather weak hind quarters. Their heads are proportionately very large, and not handsome, but the little animals are extremely intelligent and serviceable.

BRONDEL, John Baptiste, American clergyman: b. Bruges, Belgium, 1842; d. Helena, Mont., 1903. He studied in the American College of the University of Louvain and was ordained to the Catholic priesthood in 1864. He came to America and from 1867–77 was rector at Steilacoom, Wash., and at Walla Walla, 1877–78. In 1879 he became bishop of Vancouver Island, and was appointed, in 1883, administrator apostolic of Montana, becoming later bishop of Helena. Bishop Brondel is especially known for his labors among the Indians. His influence over them was very great and it was availed of several times by the national government.

BRONGNIART, brō-ñyär, **Adolphe Théophile,** French botanist, son of Alexandre Brongniart: b. Paris, 14 Jan. 1801; d. there, 19 Feb. 1846. He first studied medicine and received his diploma of doctor of medicine in 1826; but afterward turned his attention to the physiology of plants and antediluvian phytology. In 1833 he succeeded Desfontaines as professor of botany at the Jardin des Plantes; as a member of the Academy of Sciences, in 1834, and in 1839 as professor of botany at Museum of Natural History in Paris. His researches were various, and among his numerous works are ‘Histoire des végétaux fossiles’ (1828–47); ‘Essai d'une classification naturelle des champignons’ (1825); ‘Mémoire sur la structure et les fonctions des feuilles’ (1871). His ‘Enumeration des genres de plantes cultivées au Musée d'Histoire Naturelle de Paris’ (1843), played an important part in the development of modern systems of classification.

BRONGNIART, Alexandre, ä-lĕks-ändr, naturalist and mineralogist: b. Paris, 5 Feb. 1770; d. there, 7 Oct. 1847. He turned his attention at a very early age to the study of the ceramic art; and after having served for some time in the army on the medical staff in 1797 he became professor of natural history in the Ecole Centrale and was appointed, in 1800, director of the porcelain manufactory at Sèvres, where he revived the art of painting on glass.

In 1797 appeared his ‘Classification des reptiles,’ and in 1807 ‘Traité Elémentaire de Minéralogie’; and about the same time his labors in the department of natural history brought him into contact with Cuvier, whom he aided materially in classifying the newly discovered fossils of Montmartre. Along with Cuvier he engaged in the composition of the ‘Essai sur la géographie minéralogique des environs de Paris,’ first published in 1811, and afterward in 1822, much enlarged, under the title of ‘Description géologique des environs de Paris.’ In 1844 appeared his ‘Traité des arts céramiques.’ He succeeded Haüy as professor of mineralogy in the Museum of Natural History in 1822.

BRONI, brō'nē, a town of northern Italy, with mineral springs, 11 miles southeast of Pavia. Near by is the castle of Broni, where Prince Eugène obtained a victory over the French in 1703. Pop. 5,147.

BRONN, Heinrich Georg, hīn-rĭʜ gā-ōrʜ brŏn, German naturalist: b. Ziegelhausen 1800; d. 1862. He was educated at the University of Heidelberg, where he was nominated professor in 1828, and was later appointed lecturer on zoology in succession to Leonhard. Among his various scientific works may be named ‘System der urweltlichen Konchylien’ (1824), which was followed by ‘System der urweltlichen Pflanzentiere’ (1825). His most important geological work was ‘Lithæa Geognostica’ (1836–38) on rock formations. ‘Allgemeine Zoologie’ (1850) was the first attempt to develop zoology in its entirety with reference to extinct organisms. He published, in 1860, a translation of Darwin's ‘Origin of Species.’

BRONSON, Solon Cary, educationalist and theologian: b. West Union, Iowa, 26 July 1855. He was educated at Upper Iowa University, Garrett Biblical Institute and Cornell College, Iowa, and ordained a Methodist Episcopal minister in 1878. He became successively pastor at Hopkinton 1878–81, Waterloo 1881–84, Toledo 1884–87, Clinton 1887–92, Burlington 1892–96, when he became connected with Garrett Biblical Institute as Cornelia professor of practical theology. In 1913 he became professor in the same institution of practical theology and social relations. He was acting president of Garrett Biblical Institute and secretary of the faculty from 1908–09. Among his published works are ‘Religious Delusions’ and various lectures and sermons.

BRONTË, brŏn'tā, **Anna** (Acton Belle). See Brontë, Charlotte, Emily and Anne.

BRONTË, Charlotte, Emily and **Anne,** English novelists. Their father, Patrick Brontë (1777–1861), belonged to a family of Irish Protestants named Prunty or Brunty. He was born in the village of Emdale, in county Down, Ireland. By schoolmastering he earned money enough to take him to the University of Cambridge, where he graduated B.A., at Saint John's College in 1806. Ordained the same year to a curacy in Essex, he subsequently migrated to Yorkshire, and in 1811 obtained the living of Hartshead-cum-Clifton, to the east of Halifax. There he met his future wife, Maria Branwell of Penzance, then on a visit to her friends in the north. They were married on 29 Dec. 1812. Both husband and wife, it is interesting to note, had a zest for writing. A little manuscript in Mrs. Brontë's hand is still extant; and Mr. Brontë published between 1811 and 1818 two volumes of meditative verse and two didactic stories, one of which follows the lines of Richardson's ‘Pamela.’ In 1815 Hartshead was exchanged for Thornton, another small parish near Bradford, in a bleak and lonely district. To this new home the Brontës brought with them two children, Maria and Elizabeth. At Thornton were born Charlotte (21 April 1816), Patrick Branwell (26 June 1817), Emily Jane (30 July 1818), and Anne (17 Jan. 1820).

A month after the birth of their last child, the Brontës moved to Haworth, near Keighley, a village that then consisted mainly of a street of gray stone houses running irregularly up a hillside by the church and the graves to the parsonage near the summit. As perpetual curate of the parish, the elder Brontë there passed his life; and there the children all grew up within sight of the broad and sweeping moors, wild and bleak in winter but grand and glorious in summer. Mrs. Brontë, a frail woman like her daughters, died in September 1821, worn out by the birth and care of six children; and the next year Miss Branwell, an unmarried sister, came to Haworth to manage the household with the aid of the faithful old servant «Tabby.» After the death of his wife, Mr. Brontë, always eccentric and austere, grew morose; and Miss Branwell seems to have been rather prim and reserved. Wherefore the children were left much to themselves. In 1824 the daughters were placed in a school at Cowan Bridge, a hamlet on the road between Leeds and Kendal, where they remained for about a year to their great discomfort. Just after leaving school Maria and Elizabeth died of consumption, brought on, Charlotte thought, by bad food and brutal treatment.

Soon after this, Charlotte, Emily and Branwell — for so they always called their brother — began to write «original compositions» in a curious microscopic hand, which they stitched into booklets and covered with brown paper. The specimens of Charlotte's stories, such as ‘The Adventures of Ernest Alembert,’ which have been printed as literary curiosities, show a facile pen and a remarkable command of vague and ornate phrases. She, and no doubt Emily and Branwell, had been reading Scott and the Gothic romances. In January 1831 Charlotte was sent to a school kept by Margaret Wooler at Roehead, between Leeds and Huddersfield. Though she remained there but a year, she formed a strong attachment for Miss Wooler and several of the girls, especially for Ellen Nussey, with whom she kept up a life-long correspondence. In 1835 she returned to Roehead as a teacher, in company with Emily as a pupil. After three months Emily became homesick and her place was taken by Anne. Charlotte stayed on with Anne till Christmas, when both returned to Haworth. Charlotte was completely worn out by the work, for which she was ill adapted. During the next years Emily remained at home, while Anne and Charlotte went out as governesses. Charlotte had a hard time of it in her first position, but received better treatment on a second trial in 1841. In the meantime, she rejected two offers of marriage. With a view to setting up a school of their own, Charlotte and Emily went over to Brussels in 1842 to prepare themselves, especially in French and German, at the Pension Héger, a large school under the management of M. Paul Héger and his wife. They advanced rapidly in their studies, receiving high praise from their master. Called home within a year by the death of Miss Branwell, Emily remained with her father, but Charlotte returned for a year as teacher of English. Homesickness and anxiety for her father, whose eyesight was failing, brought Charlotte back to the parsonage. Brief as was the sojourn abroad, it was of the greatest value to the sisters. Without that experience, neither of them would likely have written novels that are still read.

In 1846, Charlotte, Emily and Anne published jointly a volume of ‹Poems› under the names of Currer, Ellis and Acton Bell. The little volume was hardly noticed, though it contained Emily's fine stanzas on the ‹Old Stoic.› At this time each of the sisters was getting ready a novel. After traveling from publisher to publisher, Emily's ‹Wuthering Heights› and Anne's ‹Agnes Grey› were accepted and published together in December 1847, under the authors' pseudonyms, and «on terms somewhat impoverishing.» Fifty pounds was advanced to Newby, the publisher, on account and never returned. Charlotte's ‹Professor,› which became detached from the other two novels in the long journey, was everywhere rejected; but Smith and Elder intimated to her that they were willing to consider «a novel of a more striking and exciting character.» ‹Jane Eyre,› by Currer Bell, already completed, was at once accepted and published in October 1847, two months before her sisters' novels came out. In January 1848 it went into a second edition with a dedication to Thackeray. Charlotte Brontë at once took her place among the great novelists of the period.

The next year appeared Anne's second novel, the ‹Tenant of Wildfell Hall.› By this time sorrow and death were settling over the Yorkshire parsonage. Branwell, who had started out in life with the intention of becoming a portrait painter, fell into evil ways and slowly degenerated through long years under the eyes of his sisters. After several attacks of delirium tremens, the end came in September 1848. When he felt the approach of death, he rose to his feet and died standing in order to prove that as long as there is life there is strength of will to do as one chooses. Emily drooped and died on 19 December, refusing to see a physician till just before the end. Among the poems she left unpublished were the memorable ‹Last Lines,› and several other stanzas which Matthew Arnold justly placed by the side of Byron's poems for vehemence, passion and pain. Anne, long in declining health, was taken over to Scarborough where she died of consumption on 28 May 1849, within sight and sound of the sea she passionately loved. She lies buried in the Scarborough churchyard. Like Emily, she also left behind «last verses» in a noble but more subdued key. Charlotte lived on with her father in great loneliness, publishing ‹Shirley› in 1849 and ‹Villette› in 1853. She visited London several times, and on two occasions she met Thackeray, with whom she was greatly puzzled. To Mrs. Elizabeth Gaskell, the novelist, who made her acquaintance among the lakes of Westmoreland in 1850, she seemed like one from whom suffering had taken «every spark of merriment» and «to be shy and silent from the habit of extreme, intense solitude.» After a courtship of some years, broken off by her father, she married, on 19 June 1854, the Rev. Arthur Bell Nicholls, who had served as curate at Haworth. Her married life, which promised much happiness, was brief. She passed a few months on her husband's estates in Ireland and then returned to Haworth to die on 31 March 1855. She was buried in the church by the side of Emily and Branwell. Two years after her death, the ‹Professor,› nine times rejected, was published with a note by Mr. Nicholls. The fragment of a story called ‹Emma,› which had been begun in 1854, appeared in *Cornhill Magazine* for April 1860, along with Thackeray's beautiful tribute under the title of the ‹Last Sketch.› Settling permanently in Ireland, Mr. Nicholls died there in 1906.

A glamour rests over these children of an Irish clergyman who had strayed to the Yorkshire moors. What Charlotte said of Emily and Anne may be said of herself also: «For strangers they were nothing; for superficial observers less than nothing; but for those who had known them all their lives . . . they were genuinely good and truly great.» In them all, except perhaps Charlotte, lurked consumption; and they all died young. Two were endowed with unusual talents and two were geniuses. Much, no doubt, that has been reported of Branwell is legendary, but he certainly possessed the Brontë taste for art and letters. A beautiful reproduction of his portrait of Emily was engraved from a photograph for the Haworth edition of ‹Wuthering Heights› (1900). At one time he aspired to win a name in literature. A letter of his to Wordsworth, enclosing a few stanzas of verse and asking for the poet's opinion of them, is as pathetic as remarkable in tone and style. «From the day of my birth,» he said, «to this the nineteenth year of my life I have lived among secluded hills, where I could neither know what I was or what I could do. I read for the same reason that I ate or drank, because it was a real craving of nature. I wrote on the same principle as I spoke — out of the impulse and feelings of the mind; nor could I help it, for what came, came out,. and there was the end of it.»

That pressure of utterance which opium and alcohol brought to naught in this case was characteristic of the sisters. They wrote because they could not help it. Anne possessed less of the Brontë fire. Fragile and gentle like her mother, she was «the prettiest . . . with light brown hair, violet eyes and pencilled eyebrows.» Without the outlook that came to Emily and Charlotte from their stay abroad, she moved in the narrowest circle of experience easily imaginable. Her novels, in consequence, suffered much by comparison. They are, however, storehouses of biographical incident relating to the family, and for themselves they are interesting, notwithstanding their crudeness, as transcripts of Yorkshire ways and manners at a time when the daughters of clergymen were forced to become governesses.

Emily's genius towered far above the rest. Of the poems the sisters published together, only hers cling to the memory. Under more favorable surroundings she should have become a poet ranking with Christina Rossetti and Mrs. Browning. One may pick flaws enough in ‹Wuthering Heights.› It is ill put together and perhaps the author has not fully realized her aim. It is no doubt brutal where it was intended not to be. But it displays the same intense power of utterance as the poems. It is one of the great things in English fiction, not much like any romance before or since its time. Over it hangs the mystery of the moors and their solitary wanderer.

‹Wuthering Heights,› however, has never gained the popularity of Charlotte's novels. To many it is nightmarish and repellant. It is not softened by the humanity of Charlotte who mingled more with the world. ‹Jane Eyre› was based upon Charlotte's experiences as schoolgirl and governess. As a picture of the life of the times in the north, it came as a startling revelation. Its characters were drawn on hard and unconventional lines totally unlike the run of novels women were then writing. Against the author was brought the charge of coarseness and brutality, though no mind was ever cleaner than hers. The novel was really the wail of a human soul compelled to haunt the Yorkshire moors. ‹Shirley› was quieter in tone; but it caused a stir in the north, for the characters were easily recognized portraits, among which was a superb study of Emily as Shirley Keeldar of quivering lip, dilating nostrils and wild, fascinating eyes, when moved to passion or strange, Titanic visions. ‹Villette,› which is the ‹Professor› worked over, was founded on Charlotte's life in Brussels. Though it suffers somewhat from its foreign setting, it is perhaps her masterpiece. Lucy Snowe and Paul Emanuel are her most elaborate characters, and nowhere else has Charlotte Brontë so subtly analyzed states of mind verging into madness. See JANE EYRE; WUTHERING HEIGHTS.

Bibliography.— ‹The Life of Charlotte Brontë› by Mrs. Elizabeth Gaskell (London 1857, afterward revised and frequently reissued) is among the finest biographies in the English language. It should be supplemented, however, by C. K. Shorter, ‹Charlotte Brontë and her Circle› (London 1896) and ‹Charlotte Brontë and her Sisters› (New York 1905). Interesting but less valuable biographies of Charlotte Brontë have been written by T. W. Reid (London 1877), and A. Birrell (London 1887). Consult also ‹Emily Brontë› by A. Mary F. Robinson in the ‹Eminent Women Series› (Boston 1883); Swinburne's ‹A Note on Charlotte Brontë› (London 1877); F. A. Leyland's ‹The Brontë Family› (London 1886); Wright's ‹The Brontës in Ireland› (New York 1893); C. K. Shorter's ‹The Brontës› (London 1907); May Sinclair's ‹The Three Brontës› (London and New York 1913), and the ‹Publications› of the Brontë Society. The ‹Life and Works of the Sisters Brontë› with a preface by Mrs. Ward, and introduction and notes to Mrs. Gaskell's ‹Life› by C. K. Shorter (7 vols., London and New York 1899–1900) is the best complete edition yet published. Charlotte Brontë's ‹Adventures of Ernest Alembert› is included in Nicholl and Wise, ‹Literary Anecdotes of the Nineteenth Century› (Vol. II, London 1896). In the London *Times* of 29 July 1913 a number of letters were published; these had passed between Charlotte Brontë and Héger, her teacher in Brussels. The letters shed a new light on the hero of ‹Villette.›

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BRONTÉ, Charlotte, Mrs. Gaskell's Life of. The best biography of Charlotte Brontë is that by Mrs. Gaskell (Elizabeth Cleghorn Stevenson). It maintains its high place in English literature by virtue of many qualities. It is not often that a biography is written by one so thoroughly able to understand and sympathize with the subject. If for no other reason, Mrs. Gaskell's volume would be worthy of careful consideration because of the fact that it is the work of one gifted woman novelist narrating and interpreting the life of another. In addition to this happy circumstance, Mrs. Gaskell brought to her labor an actual gift for biography, with which she combined the careful investigation and accuracy of a historian. To supplement her personal knowledge of the subject, she spared no pains to obtain all possible information. The result is that no subsequent biography of Miss Brontë has superseded that by Mrs. Gaskell. The one error charged against the author was what has been termed her «singularly reckless treatment of living people.» She found it necessary, in consequence of threatened suits for libel, to cancel a number of passages. We may agree that now and then she may not have maintained a strictly judicial attitude, and that some of her inferences in regard to other people may not have been correct or wise. «The great thing for us,» as May Sinclair reminds us, «is that she was right about Charlotte Brontë. She was right with a rightness which no biographer and no critic of the Brontës has ever so securely attained. When all the old rubbish has been sifted. . . we shall come back to Mrs. Gaskell's ‹Life› with the certainty that we shall find there the truth about Charlotte Brontë, all that was most profoundly and essentially she. Others have opined, inferred, conjectured. Mrs. Gaskell knew.» Even apart from its accuracy, the ‹Life,› like that of Nelson by Southey, would probably maintain a place in literature by reason of its skilful manner and charming style. Mrs. Gaskell's pen is as sure in this work as it is in ‹Cranford.› From the excellent portrayal of the conditions surrounding the Yorkshire village of Haworth as a prerequisite for a clear understanding of such a life as that of Charlotte's, to the chastened and reserved description of Miss Brontë's death, there is no false note in the narrative. The work is a masterpiece. Consult May Sinclair's penetrating introduction to the ‹Life› in ‹Everyman's Library.›

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BRONTOTHERIUM, or TITANOTHERIUM, a genus of the extinct mammals first found in the Bad Lands of South Dakota and later in Nebraska and Colorado. The formation is Miocene and the genus is but one of an extinct family of herbivorous mammals. It had the following features: The skull was long and depressed, with a large pair of horn cores, placed transversely on the maxillary bones, in front of the orbits; the nasal bones, which were greatly developed and firmly co-ossified, protrude over the narial orifice; the brain cavity was small and did not extend over the cerebral hemispheres or the cerebellum, and but little over the olfactory lobes; the neck was of medium length and stout; axis was large and extended transversely, being massive, with odontoid process stout and conical; lumbars were slender and not as large as the dorsals, and there were four sacral vertebræ; a long and slender tail, indicated by the caudals; limbs somewhat shorter than the elephant's; radius separated from the ulna; carpal bones short and supporting four toes; tibia separated from the fibula; three toes of almost equal size on the hind foot.

BRONX, The, a borough of New York city, 42 square miles in extent, comprising the section of the city northeast of the Harlem River, with adjacent islands. The Bronx River flows through it. The northern part is suburban in character, but the southern part has become closely built up within recent years. While mainly residential, the borough contains a great number of industrial establishments. In 1913 it was made a separate county, and on 1 Jan. 1914 the new county government went into operation. For population, government, education, etc., see NEW YORK CITY.

BRONZE, in its strictest sense, is a solid solution of tin in copper. As generally used the term signifies any alloy consisting of proportions of copper and tin, varying according to the purpose desired, to which lead, zinc, aluminum, and silver also, are sometimes added for the purpose of giving greater brilliancy to the compound, or rendering it more fusible, the zinc being introduced in its combination with copper as brass. In some of the modern so-called bronzes, brass is used instead of tin; these are then nothing more than forms of brass, with very large proportions of copper. The true bronzes in general use vary the proportions of copper to tin from 5 to 1 to 24 to 1 (by weight). These alloys are not often used in the arts as they are difficult and costly to finish either with tool or machine. Mixtures of these bronzes with lead, zinc, nickel, phosphorus and aluminum are abundantly strong and much easier to work. Where the proportion is larger in tin, the color of the bronze is whitish or gray, and as the copper component is increased the color passes through shades of bluish red and reddish yellow to the brick red of pure copper. It is claimed by some founders that a chemical union of copper and tin is effected only in one or two definite proportions, and that mixtures in other proportions are defective, particularly so for engine work where they are subjected to fluids at high pressures — in which cases they develop porosity. The addition of a small amount of lead, however, seems to do away with this difficulty. The uses of bronze in the arts, as defined by the proportion of the tin component, are as follows: With 5 per cent tin, soft gun-metal castings; with 7 per cent tin, mathematical instruments; with 8½ per cent tin, toothed gear wheels; with 8 to 12 per cent tin, soft bronze statues, medals, coins and cannon; with 12 to 15 per cent tin, machine and engine bearings; with 16 per cent tin, soft-toned bells; with 18 to 20 per cent tin, gongs, house bells and cymbals; with 22 per cent tin, school bells; with 24 per cent tin, church bells and fire bells; with 33 per cent tin, the so-called speculum metal for telescope mirrors and surgical instruments. Bronze was used by the ancient Assyrians and Egyptians. Layard brought many ornaments and other articles of this metal from Assyria. It has been found, on examination, that the bronze weapons of the Greeks and Romans were of the best composition for securing the greatest density in the alloy, and the cutting edges were brought to the highest point of tenacity by hammering. For ornamental articles, zinc and lead are frequently added. These two metals are usually contained in the bronzes of France along with the copper and tin. Japanese bronzes frequently contain silver and gold (sometimes to the exclusion of tin) and also lead. A greenish color has been imparted to ancient bronzes by oxidization. This has been imitated in modern bronzes by chemical treatment. The heat-black finish on bronze, brass and copper is obtained by the use of two solutions: (1) Nitrate of copper, 1 oz.; water, 1 oz.; (2) nitrate of silver, 1 oz., water, 1 oz. The solutions are mixed for application in the proportions: water, 3 oz.; copper solution, 2 oz.; silver solution, 1 oz. The surface of the bronze to be treated may first be submitted to a sand blast to roughen it. The bronze is heated on a hot iron plate, or in an oven, to about 250° F., and the mixed solution is applied with a cotton swab or soft brush. The coating dries greenish, and should be allowed to stand till it is a uniform black. Then it is permitted to cool and is brushed over with metal brushes. It will then appear a brownish black. To produce a dead black, a solution of 2 oz. liver of sulphur to the gallon of water is swabbed over it. When dry it is brushed with bristle brushes and finished with a wax polish or with lacquer. Bronzing upon brass and copper to produce artistic texture and color effects is accomplished by varied manipulations of the electro-plating processes to deposit an actual bronze coating upon the objects treated.

The «bronzes» used in the economic arts are the three-metal or poly-metal alloys, made by adding other metals to the true copper-tin bronzes, and in several mixtures dispensing with the tin altogether. The metals chiefly in use in these alloys with bronze are lead, zinc, phosphorus, manganese and aluminum. In general, lead gives to bronzes a superior machining quality, and a dull bronzy polish highly esteemed in statuary. The lead alloy is called «plastic bronze.» Its ultimate lead content is 30 per cent — with copper, 65 per cent, and tin, 5 per cent. This bronze, though soft, stands up well in heavy locomotive bearings. There is some difficulty in making this alloy, due to the segregation of the metals, but this has been remedied by adding about 1 per cent of nickel. Zinc added to bronze gives greater ease in cold rolling and forging. In most maganese bronzes zinc takes the place of tin, so that these bronzes are really brasses. Examples of copper-tin-zinc bronzes are the United States «Standard Bronze No. 2» (copper, 88 per cent; tin, 10 per cent, and zinc, 2 per cent), and «Admiralty gun-metal» (copper, 86 per cent; tin, 13 per cent, and zinc, 1 per cent). The addition of phosphorus to bronze imparts greatly increased hardness and wearing qualities, but if the proportion is not kept low the tensile strength and elastic limit are impaired. In the malleable phosphor-bronzes the top limit for tin is 8 per cent, and for phosphorus 0.8 per cent. The phosphorus alloys generally consist of about 90 per cent of copper, 9 of tin and from 0.5 to 0.75 of phosphorus. By varying the proportion of the constituents, the hardness, tenacity and elasticity of the alloy may be modified at pleasure. Its special characteristics are resistance to corrosion by salt water, which affects all zinc alloys to some extent, its resistance under abrasion and its high qualities as a constructive material. Great hardness and tenacity with little elasticity can be conferred on it for the making of ordnance, and hardness and tenacity combined with permanent elasticity can be given to it for the making of parts of machines, etc. In the elastic condition it is peculiarly well adapted for the bearings of machinery, since it produces very little friction. The standard phosphor-bronze used for bearings in railway cars is composed of 76.8 per cent of copper, 8 per cent of tin, 15 per cent of lead and 0.2 per cent of phosphorus. For large castings the proportions are: Copper, 90 to 92 per cent; tin, 7.4 to 9.7 per cent; phosphorus, 0.3 to 0.6 per cent. For braiding the covering of submarine electric cables the proportions are: Copper, 92.9 per cent; tin, 6.55 per cent, and phosphorus, 0.32 per cent. The addition of phosphorus has another important effect. When the proportion exceeds 0.5 per cent it gives a warmer color to the bronze, making it resemble gold largely alloyed with copper. This form is therefore largely used for works of art. Arsenic may be substituted for phosphorus in all the phosphor-bronze formulas with practically the same effect. Manganese bronze, as has been noted, is really a form of brass. If it contains any tin at all, the amount is small. Iron is often added to this bronze to impart a high elastic limit. It has a low melting point and is readily cast into the most intricate forms. For sheets and forgings, manganese bronze carries 60 parts of copper, 39 parts of zinc and 2 parts of steel alloy; for sand casts, 56 parts copper, 43 parts zinc and 2 parts «steel alloy.» This «steel alloy» is composed of tin, 29.03 per cent; wrought iron, 58.06 per cent, and of 80 per cent ferro-manganese, 12.91 per cent. Manganese bronze is classed as red and yellow: the red is composed of copper, 80 parts; tin, 10 parts, with 10 parts of a 20 per cent manganese-copper alloy. It is used for gear wheels; the yellow is composed of 50 parts of copper, 6 parts of 20 per cent manganese-copper and 44 parts zinc, and is used for gun mechanism, automobile castings, motor-boat shafts and propeller blades, as it is non-corrodible in sea water. It is also used for the vanes or blades in steam turbines where the erosive action of the steam is severe. A special type of this alloy is called «Naval Manganese Bronze»: it consists of copper, 57 per cent; zinc, 40 per cent; iron, 1 per cent; manganese, 0.75 per cent; aluminum, 0.75 per cent; tin, 0.50 per cent. A very fine bell metal is composed of copper, 90 parts; tin, 5 parts; zinc, 5 parts, and manganese, 1 part. «White Manganese Bronze» is a quite different alloy: it contains copper, 68 per cent; manganese, 18 per cent; zinc, 13 per cent, and aluminum, 1 per cent. The tensile strength of cold rolled manganese bronze is 95,000 pounds per square inch; of castings, 70,000 pounds per square inch. «Turbandium Bronze» is the trade name for an alloy containing copper, 48 per cent; zinc, 46 per cent; iron, 1 per cent; manganese, 1.75 per cent; nickel, 2 per cent; tin, 0.5 per cent; aluminum, 0.2 per cent. It is non-corrodible by sea water and is especially valued for ships' propellers. Aluminum bronzes carry from 9 to 11 per cent of aluminum and are of a golden color. They are very viscous in the liquid state even at the highest temperature. They pour thick and sluggish, owing to a tenacious film of oxide of the aluminum which invariably covers the surface. For this reason they are poured very slowly and so as to enter the bottom of the mold. In large castings risers are necessary to overcome the shrinkage of the alloy. The temperature should not be higher than from 100° to 150° above the setting temperature of the alloy. Aluminum bronze has properties very similar to Swedish Bessemer steel, and withstands «fatigue» from 9 to 15 times longer than the best manganese bronze. The addition of titanium tends to remove the troublesome oxidation and reduces segregation. Thus titanium-aluminum bronze is the hardest of all the bronzes, but of little use in the arts as it cannot be worked. The proportions of the alloy are copper, 76 per cent; titanium, 12 per cent, and aluminum, 12 per cent. It is made by adding the titanium to aluminum bronze. Its tensile strength is 100,000 pounds per square inch. A form of this bronze offered in the market under the trade name of «Titan Bronze» has a tensile strength of 110,000 pounds. It is extremely plastic and is forgeable and is supplied in hot-rolled bars, hot and cold-rolled sheets, castings and recasting ingots. «Chromax Bronze» is a trade name for a chrome-nickel bronze, white in color and capable of taking a high polish. It has a denser structure and greater compression strength than manganese bronze, and can be rolled into sheets and drawn into wire. Its tensile strength is 79,000 pounds per square inch. «Tobin Bronze» is another commercial bronze, composed of copper, 59 per cent; zinc, 38 per cent; tin, 2 per cent, and lead, 0.5 per cent. The name «steel-bronze» is given to bronze condensed and hardened artificially, as in the making of cannon the bore of which is enlarged and the metal compacted by forcing in several strong steel cylinders of gradually increasing sizes in succession. See Bronzes.

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BRONZE AND BRASS WORK. There is a strong tendency at present to obliterate, or to regard as merely nominal, the distinction between these two alloys. As a matter of fact, they approximate each other in composition, and to a considerable extent overlap in uses. The following table, published in the *Journal of the Society of Constructors of Federal Buildings*, Brattleboro, March 1916, may be taken as representing present-day views of the varied range of alloys under the general terms «brass» and «bronze.» Note the different alloys used in «statuary bronze»:

	Copper	Tin	Zinc	Lead
Statue of Louis XV (Paris)	82.4	4.0	10.30	3.2
Statue of Henry IV (Paris)	89.6	5.7	4.2	0.5
Statue of Napoleon I (Paris)	75.0	3.0	2.0	2.0
Column Vendome	89.2	10.2	0.5	0.1
Bacchus (Potsdom palace)	89.4	7.5	1.63	1.0
Munich bronze	77.03	0.91	19.12	0.12

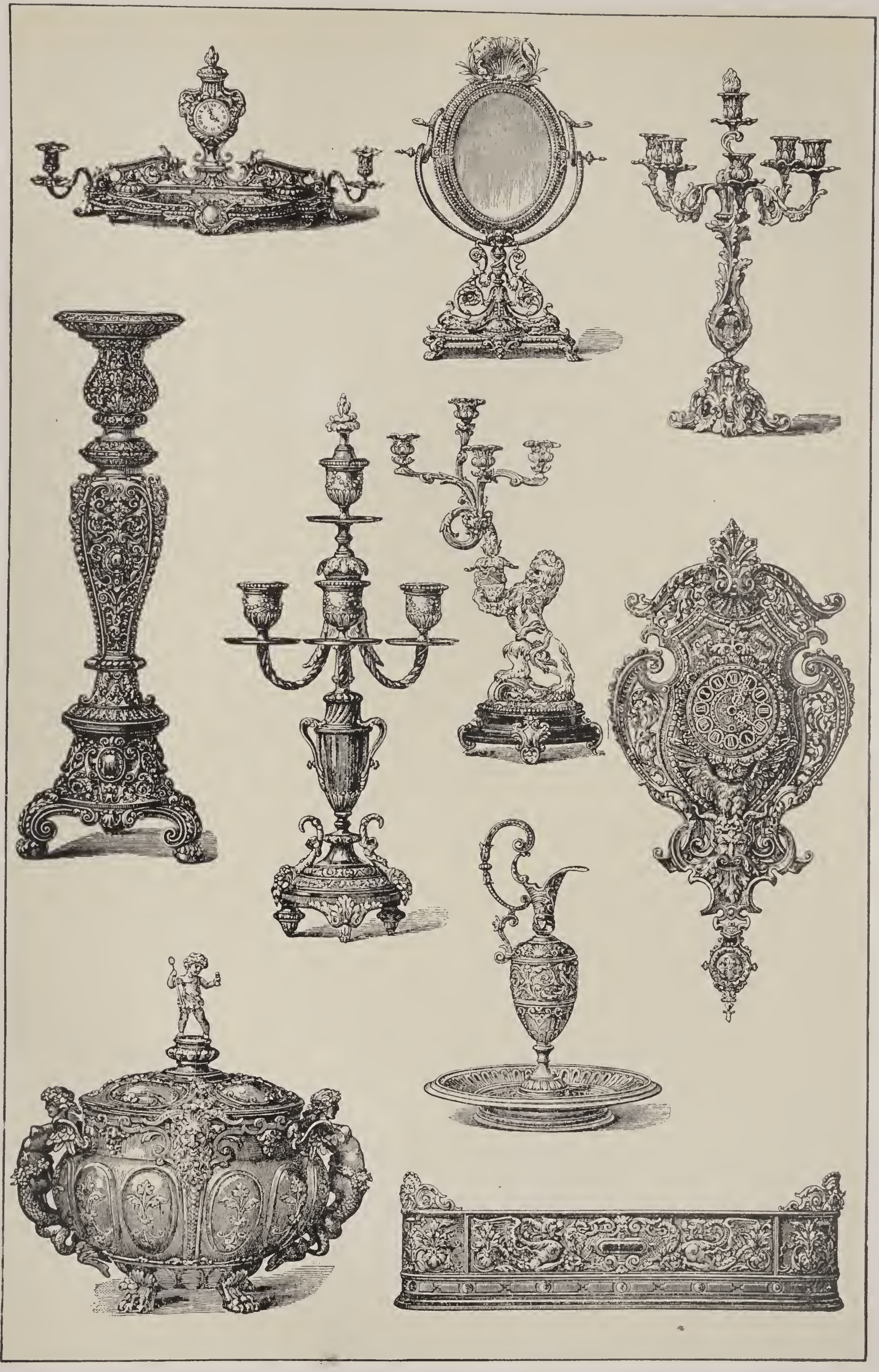
Modern usage	Copper	Tin	Zinc	Lead
Statuary bronze	90.0	3.0	2.0	5.0
Statuary bronze	85.0	6.0	5.0	4.0
Statuary bronze (D'Arcet formula)	78.5	2.9	17.2	1.4
Yellow brass (common)	$63.\frac{2}{3}$	....	$33.\frac{1}{3}$	....
Yellow brass (for brazing)	75.0	1.0	24.0	....
Yellow brass (tough for bearings)	75.0	15.0	10.0	....
Tough brass (Thompson's formula)	55.0	0.5	44.5	....
Brass (common)	84.3	10.5	5.2	....
Brass (common hard)	79.3	14.3	6.4	....
Brass (rolled)	74.3	3.4	22.3	....
Brass (very tenacious)	88.9	8.3	2.8	....
Brass (wheels, valves)	90.0	10.0	....	....
Brass (white)	10.0	10.0	80.0	....
Brass (wire)	67.0	....	33.0	....
Brass (yellow, fine)	66.0	....	34.0	....
Bronze (red)	87.0	....	13.0	....
Bronze (red)	86.0	2.9	11.1	....
Bronze (gun metal large)	90.0	10.0	....	....
Bronze (cymbals)	80.0	20.0	....	....
Bronze (medals)	93.0	7.0	....	....
Bronze (phosphor)	92.0	8.0	....	....
Bronze (statuary)	91.4	1.4	5.5	1.7
Church bells	80.0	10.1	5.6	4.3
Church bells	69.0	31.0	....	....
Gun metal	90.0	9.0	1.0	....
House bells	77.0	23.0	....	....
Machinery bearings	87.5	12.5	....	....

The most important present-day uses of bronze are those classified under the two general headings of sculptural and architectural bronze work. The long lists of such works include statues (from the small figures so commonly used as interior ornaments to the colossal equestrian statues), memorial tablets and windows, doors (often elaborately ornamented), lecterns, wrought bronze-and-brass entrance gates or vestibule gates and bronze chancel-rail or altar gates, grilles, hall-screens, lamp-standards, elevator enclosures and elevator doors, counter-screens, check-desks, cage work and safe-deposit screens in banks, flag-pole bases, large clocks that are made a part of the architectural scheme, stair railings, sarcophagi, tripods, urns, sun dials, balcony railings and domes — such as that made for the Armour mausoleum. In the United States no bronze statue was cast prior to the year 1847, and the earliest productions, about the middle of the 19th century, lacked perfection for the reason that the assistance of professional founders with European training was not available at that time. A portrait statue by Bale Hughes and Henry Kirke Brown's «Indian and Panther» are the earliest examples known. A great impetus was given to sculptural art when the government of the United States ordered bronze doors for the National Capitol. Randolph Rogers and Thomas Crawford were chosen to do this work. The former modeled his doors in Europe, and they were cast in 1861. The Crawford doors were hung in 1868. Louis Amateis designed the third and last pair of bronze doors for the main entrance to the Capitol at Washington (cast in 1910). The three sets of bronze doors in the main entrance of the Boston Public Library are the work of Daniel Chester French. Of the three sets of sculptured bronze doors for the main entrance of the Congressional Library at Washington, one was modeled by Herbert Adams, one by Olin L. Warner and the third by Frederick MacMonnies. Large cast bronze grille entrance doors, designed by Richard M. Hunt for a residence at Newport, R. I., were made in New York (1892) at a cost of $50,000. Their measurements are: width, 22 feet, and height, 14 feet. The total weight of bronze in the dome of the Armour mausoleum, designed by Renwick, Aspinwall and Owen, is 16 tons. Ornamental bronze work for the interior of buildings is given a coating of transparent lacquer that preserves the polish and finish for a number of years. But lacquer cannot be used to protect the surfaces of bronze statuary or other bronze work exposed to the weather; on the contrary, new bronze statuary placed out-of-doors is oxidized with chemicals, so that the glaring appearance of the new metal is subdued.

No presentation of this part of our subject, however brief, can be satisfactory unless attention is called to the emphasis that is now being laid on craftmanship. The art of the bronze founder, as practised today, possesses, in the words of one of its exponents, a subtle charm for the lover of craftsmanship. «The finished product of his skill strongly impresses the thoughtful observer, for the statue or sculptured object in plaster or other material, while the embodiment of the sculptor's genius, lacks something which only the bronze can give — the glow of color and feeling of imperishableness.» Another leader in this field makes a strong appeal for craftsmanship, expressing the belief that bronze and brass are attaining their highest artistic development, and that the craftsmen «only need opportunity, unhampered by the tendency toward commercialization of their art,» to demonstrate their artistic ability beyond dispute. (Consult *The American Architect,* 27 June 1917, Vol. CXI, pp. 399–404). Briefly, authorities on sculptural and architectural bronze insist to-day that craftsmanship, or painstaking, artistic and technical care given to each separate work, is all important. On the mechanical side, we may mention, as one of the most important modern developments in the bronze industry, an English invention — the so-called «extrusion process» of wrought shapes, by which extruded metal (a special alloy) is produced by forcing a billet of the metal, in a semi-molten state, through a steel die by hydraulic pressure. Another modern development of the bronze industry is along the line of voltaic deposition of pure copper upon prepared moulds or over a prepared model — the galvano-plastic method. Still another comparatively new process is the Gorham special (Smith) process of casting, which has been developed from a silver-casting process, is now used on objects up to 36 or 40 inches in length, and reproduces the plastic mould and form faithfully without chasing or hand-finishing.

As we have said above, the modern uses of brass overlap those of bronze to a considerable extent; but it is not less true — and this fact deserves our special attention at present — that quite beyond the zone occupied by both alloys almost indistinguishably there lies a wide industrial field that is still held by the copper-and-zinc alloy almost to the exclusion of the copper-and-tin alloy. In this connection it is well to note the adaptability of the former, as that is set forth in 'The Metallic Alloys,' W. T. Brannt, ed. (Philadelphia 1908), to the following effect: Generally speaking, brass should contain only copper and zinc, but many or most of the varieties found in commercial use as a matter of fact do contain small quan-

MODERN BRONZE WORK



tities of iron, tin, arsenic and lead, and these admixtures are due either to contaminations mixed with the ores from which the copper and zinc have been extracted or to additions made intentionally in order to change the ductility, color, fusibility, hardness, etc., of the resultant alloy. Again, copper and zinc can be combined in many ways, the proportions varying within very wide limits and the resulting alloys being adaptable to uses as varied. It is the common observation that with an increase in the content of copper the color becomes more golden and at the same time the malleability and softness of the alloy are increased. With successive additions to the content of zinc the color becomes lighter and lighter, finally shading into a grayish-white, while the alloys become more fusible, brittle and, at the same time, harder. In other words, the properties of the alloys produced in this way are different; and of course their cost of production varies also, the price of brass decreasing as the content of copper becomes less. But this is not the whole story of the adaptability of brass — the characteristic which explains the wide range of its uses at the present time. As a brief summary of the results attained in the course of very extensive researches that have been made in regard to the behavior of alloys of copper and zinc, the following statement has special value and interest: «An alloy containing from 1 to 7 per cent of zinc still shows the color of copper, or at the utmost only a slight yellow tinge. With 7.4 to 13.8 per cent of zinc, the color of the alloy undergoes a considerable change,» becoming what is described as «a pleasant red-yellow.» A pure yellow appears as a characteristic of alloys with 13.8 per cent to 16.6 per cent of zinc, while the color of alloys in which the content of zinc runs up to 30 per cent is also yellow but not pure. «It is a singular fact that with a content of over 30 per cent of zinc a red color appears again, which is most pronounced with equal parts by weight of the metals, an alloy of 50 parts of copper and 50 of zinc having almost a golden color but exhibiting also a high degree of brittleness. With a still higher content of zinc the gold color rapidly decreases, becoming reddish-white with 53 per cent, yellowish-white with 56 per cent and bluish-white with 64 per cent. With a still higher content of zinc the alloy acquires a lead color.» Obviously, then, the term «brass» designates an extensive group of alloys. The great variety or diversity of brass objects may occasion less surprise if this circumstance is kept in mind; nevertheless such diversity remains one of the striking illustrations of modern industrial ingenuity. Thus, as a few of the subdivisions under which the numberless brass objects are classified, we may mention the following: Andirons, badges, balls, barrels, bearings, bedsteads, bolts and nuts, boxes, brackets, buckles, buttons, candelabra, candlesticks, chains, checks, couplings, craft tools, curtain rings, easels, escutcheons, faucets, files, fountains, hammers, handles, hinges, hods, hooks, kettles, knobs, labels, lamps, medals, mouldings, nails, oilers, pins, pipe, plugs, poles, pulpits, pumps, railings, rings, rivets, racks, rods, screens, screws, shells (ordnance, rifle, shot-gun, torpedo, etc.), signs, springs, stamps, tablets, tacks, tags, thimbles, tubes, valves, vases, wire and wire-cloth. Utility is the characteristic appearing most plainly in this list; and although, if the list were extended, it would include a large number of architectural and sculptural objects, we should find included in it, on the other hand, a much larger number of purely utilitarian objects — things designed for common use and produced in very great or commercially adequate numbers in which the art quality is a minor consideration if, indeed, it is present at all.

The conclusion is, therefore, in respect to present-day tendencies, that specialization of utilitarian manufactures characterizes the brass industry, just as in the bronze industry the leaning is toward sculptural and architectural specialization — the architectural products having, as a rule, marked decorative and artistic qualities. Contributory to this specialization of bronze is the circumstance that the copper-and-tin alloy stands the action of the weather better than the copper-and-zinc alloy, and this of course influences the choice of material for monumental sculptures, the external portions of architectural designs, etc. In this field brass is, indeed, sometimes a convenient substitute; the superiority of bronze, however, for outdoor use is generally conceded. Even more important is a peculiarity of bronze that has been described by Mr. William Donald Mitchell in ‹The Art of the Bronze Founder› (New York 1916) as follows: «I wish to call your attention to a wonderful property that bronze possesses and that no other material or substance possesses so far as I know. I mean the peculiarity of bronze taking on beautiful colors when subjected to the action of chemicals. Now, you know the color of gold never changes. Silver will oxidize black but chemicals will not cause permanent colors to appear on silver. If you apply acids or any chemical or even water to iron, there is just one result — a red rust. But the surface of bronze reacts to chemicals applied in a certain manner as an autumn leaf does to frost. Skilled workmen called bronzers easily obtain colors which are as beautiful as those seen on the bronze works of art of antiquity. The color on ancient bronzes is called ‹patina,› which means the color or incrustation which age gives to bronze works of art, but the word ‹patina› is now generally used to describe the color on modern bronze sculptures. . . . People have said to me that they always thought bronze was the same color as the surface color ‹all the way through.› This was a very natural mistake, for it is not often that one sees the natural gold color of bronze, and it is easily understood why people should suppose that the dark bronze they saw was the same color all the way through. . . . The color on bronze is an oxidization of the surface only. It is a film of color on the surface of the bronze, but is also a part of the bronze itself — like the color on the surface of a piece of glazed pottery. Now, this oxidization on the surface of the bronze does not continue eating into the metal until the metal is entirely consumed, as the rust of iron does, but the surface of the bronze having become colored it goes no deeper; and no matter how many years roll by — yes, or centuries — the glowing golden color of the bronze will show if the surface is abraded or scratched. Thus bronze, being practically everlasting, is sometimes called ‹the eternal.› »

According to the best opinion to-day among bronzeworkers, a thin casting (of statues, busts, etc., which are always cast hollow) is to be regarded as an evidence of good foundry work; and modern practice conforms to the view that a successful bronze cast of a sculptured model cannot be made if the alloy exceeds three-eighths of an inch in thickness. The standard thickness (or thinness) is from one-quarter of an inch to three-eighths of an inch. The reasons for this are, that a thin shell of the alloy cools and sets immediately after filling the mold; that an excessive thickness of metal neither makes the casting stronger nor adds to its durability, and that, if there were too great thickness, the alloy would not harden or set for a considerable time and in the slow cooling would set up strains and shrinkages which would disturb the surfaces of the mold to such an extent that there would be a loss of fine detail.

BRONZE AGE, the period represented by archæologists as intervening between the Stone Age and the Iron Age, when weapons, utensils and implements were, as a rule, made of bronze. The demarcations of these periods, however, are far from being clearly defined and overlap to some extent. The use of stone for weapons, utensils, etc., naturally preceded the use of metals by primitive man, and the order in which the different metals would come into service would depend upon several factors. The nearness of the metallic deposits to the surface of the earth, the relative degree of purity in which they are usually found and ease in smelting and working would all affect the sequence of their introduction. The study of the traces of the Bronze Age in Europe apparently leads to the conclusion that throughout that continent the introduction of copper and its alloys was nearly synchronous, but the transition to the Iron Age took place more or less slowly in different regions, the new metal being introduced from the south and superseding bronze soonest where the paths of early commerce were most numerous or most frequently trodden. The implements of the Bronze Age include swords, awls, knives, gouges, hammers, daggers and arrow-heads. The age is also characterized by the fact that cremation was the mode of burial instead of interment. Besides weapons of various kinds and beautiful workmanship, amulets, coronets, diadems of solid gold and vases of gold ornamented with gold and bronze were produced. The weapons are often Oriental in pattern, which is an indication of the traces of Eastern culture in the Bronze Age. In Great Britain and Scandinavia the Bronze Age lingered much longer, according to certain archæologists, than in Italy, France and Spain. In Greece, the use of bronze distinguishes the Mycenæan period, especially in its earlier days. In the New World, especially in Peru, the existence of the Bronze Age is indicated. The chronology of the three ages presents marked difficulties, and the periods should be regarded as stages of evolution in civilization still exemplified among races of slow development. The Bronze Age in Europe may be approximately placed between 2000 B.C. and 1800 B.C. Consult Lord Avebury, ‘Prehistoris Times’ (1900); Evans, Sir J., ‘Ancient Bronze Implements of Great Britain’ (1881); Chartre, ‘Age du bronze en France.’

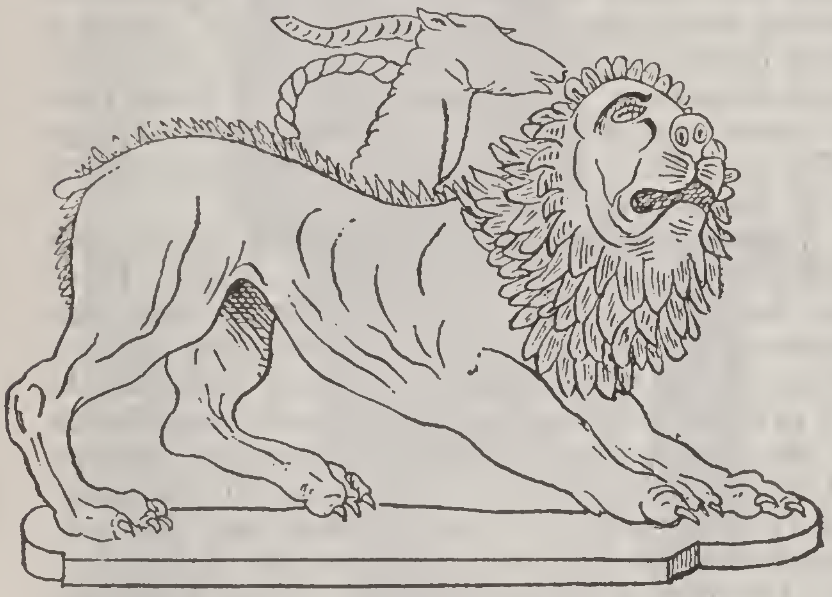
BRONZE STEEL, the name originally given to the metal obtained by the process of General Von Uchatins of the Austrian army, which process consists of casting bronze in a chill-mold and forging it cold. In the casting process hardness is increased and this has the effect of placing the interior metal in a state of compression and the exterior in a state of tension, while the metal has almost the strength and elasticity of steel. The circumstances of chief difficulty and importance in the manipulation of bronze affecting the production of cannon and large castings are: (1) The chemical constitution of the alloy as influencing the balance of hardness and tenacity; (2) its chemical constitution and other conditions influencing the segregation of the cooling mass when cast into two or more alloys of different and often variable constitutions; (3) the effect of rapid and slow cooling and of the temperature at which the metal is fused and poured; (4) the effect due to repeated fusions and to foreign constituents in minute proportions entering the alloy. In bronze, sufficient hardness must be secured to resist longest the abrasions of projectiles and deflagration of powder; along with the greatest ultimate tenacity there must be certain rigidity and ductility with ultimate cohesion; hardness and rigidity increase with the proportions of tin, ductility and tenacity with that of the copper, but not in direct ratio; specific gravity increases with copper. The fusibility is greater than copper and less than tin, ultimate cohesion less than that of tough copper but greater than that of tin, ductility greater than tin but less than copper, hardness greater than either. In consequence of the difference in the fusibility of tin and copper the perfection of the alloy depends much on the nature of the furnace and treatment of the melted metal. By these means alone the tenacity of bronze has been carried as high as 60,000 pounds.

BRONZE WING, BRONZEWING PIGEON or **BRONZE PIGEON,** any of several different species of the genus *Phaps,* found in Australia, Tasmania and New South Wales. These are birds of beautiful plumage, obtaining their name from the lustrous bronze color with which the wings are variously marked. The most familiar species is the «common bronzewing» (*Phaps chalcoptera*), a plump, deliciously edible bird, weighing about a pound, and distributed throughout Australia. It nests on low branches of trees near swamps. The «brush bronzewing» (*P. elegans*) of southern Australia and Tasmania is a groundkeeping bird and resembles a partridge in its habits. Another species is the «harlequin bronzewing» (*P. histrionica*), found in great flocks in the northwestern part of New South Wales. Sometimes the ground-pigeons of the genus *Geophaps* are called «bronzewings.»

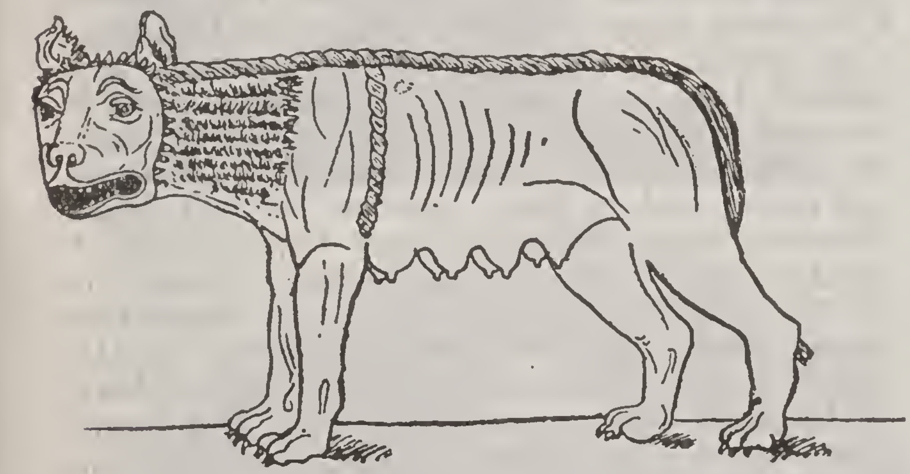
BRONZES. The art of bronze-casting was known in very early times to the Assyrians, Babylonians, Hindoos, Persians, Chinese and Japanese. Egyptian bronze work dates back to the 3d dynasty (4900 B.C.); the bronze was a natural not artificial alloy. By 1600 B.C. artificial bronze was in common use on the

Nile, and really artistic work appears from the 3d century B.C. While the early bronze work (see Bronze Age) of the nations consisted largely of weapons, armor and eating utensils, articles of decoration soon were produced and bells came into early use. To such early bronze art work belong the Assyrian Balawat gates with their bands of bronze figure subjects, and some Egyptian cast and carved bronze statues.

The Greek sculptor Lysippus (340 B.C.) signed his name on statues showing great skill and talent. By the 5th century the Greeks were able to cast statues of considerable size in a single piece. Earlier large statues were built up of plates or separate parts. The Phœnicians also did excellent work in statuary. In the reign of Vespasian (79–81) the city of Delphi had 3,000 bronze statues. The Greeks made several alloys of bronze; one much favored was the liver-colored (*hepatizon*) variety. Among the noted large bronze Greek works of art may be mentioned: the headless statue of a youth (Berlin); heroic figure of a charioteer (Athens); boy extracting a thorn («spinario») and the boxer (both in Rome); statue of a boy (New York Metropolitan Museum); «Idolino» (Florence); Hermes resting (Naples); Nike (Breccia); praying boy · (Berlin); Eros (Morgan Collection), etc.



Bronze Chimera, Florence.

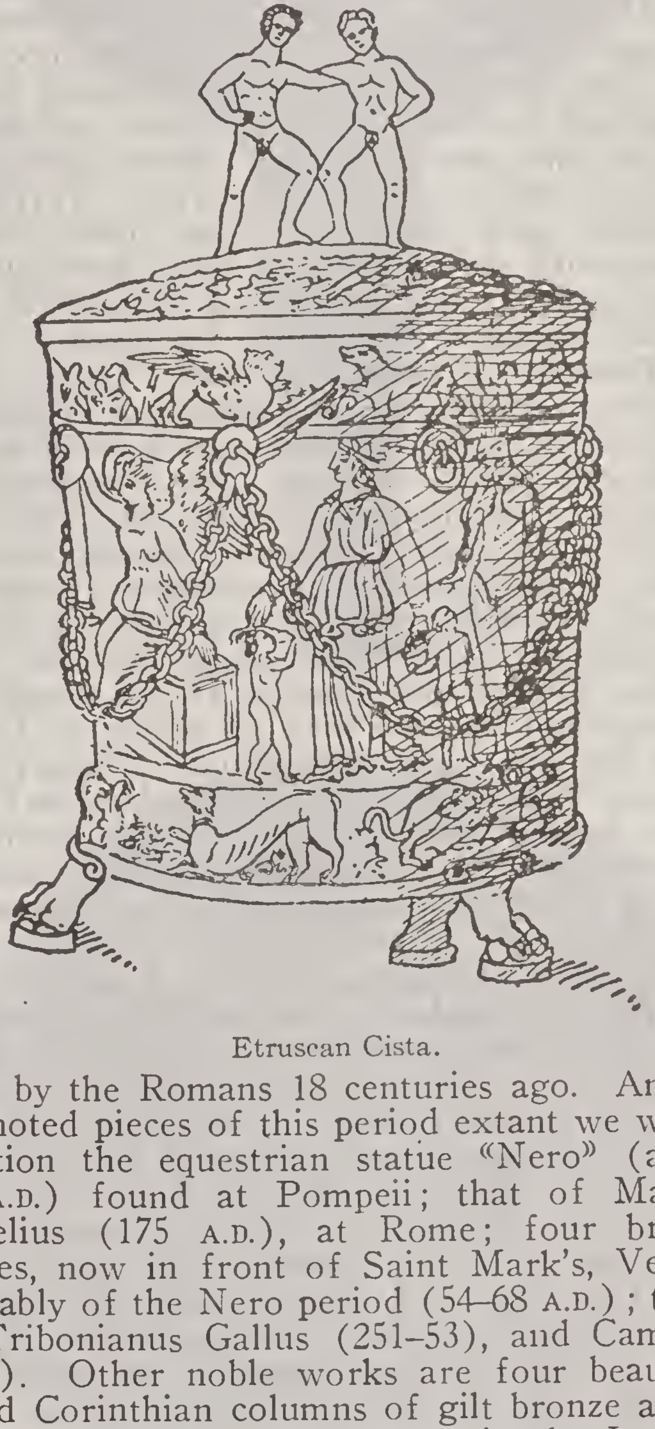


“Capitoline” Wolf, Rome.

The Greeks and Romans knew the art value of patina (see Patina) on bronze work. They termed the natural oxidation *ærugo*, but they had a more rapid, artificial rust-producing process brought about with soured wine. This latter patina they termed *æruca*.

That the ancient Etruscans were capable of casting bronze in large pieces is demonstrated by the present existing «Capitoline Wolf» (in Rome) and the chimaera (in Florence). Both bronzes show, by their archaic style, that they belong to the early stages of the Etruscan artisans. But the Etruscans excelled in producing lovely household and decorative pieces. Their many existing hand-mirrors (*specchi*), their toilet caskets (*cistæ*), etc., are truly works of art and their incised decorative treatment is greatly admired to this day.

Roman and Greco-Roman Bronzes.— Many lovely works of art in bronze, repoussé and cast, have been excavated in Italy in modern times. Pompeii and Herculaneum afforded us great examples of such work; the statuette of Narcissus is, perhaps, best known, as well as many bronze heads with eyes formed of ivory. The Naples Museum has over 14,000 examples of decorative bronzes including candelabra, tripods, chairs, couches, tables, etc., used by the Romans 18 centuries ago. Among the noted pieces of this period extant we would mention the equestrian statue «Nero» (about 65 A.D.) found at Pompeii; that of Marcus Aurelius (175 A.D.), at Rome; four bronze horses, now in front of Saint Mark's, Venice, probably of the Nero period (54–68 A.D.); those of Tribonianus Gallus (251–53), and Camillus (365). Other noble works are four beautiful fluted Corinthian columns of gilt bronze at the chapel of the Holy Sacrament in the Lateran basilica, and the massive bronze doors of the Pantheon.



Etruscan Cista.

Mediæval Bronzes.— To this period belong two bronze medallions (Vatican), each representing the heads of Saint Peter and Saint Paul facing each other. Most important are the bronze seated statue of Saint Peter in Saint Peter's basilica (Rome); and the so-called chair of Dagobert (Paris). After the fall of Rome, Constantinople became the centre of the bronze workers, and Byzantine style, of course, prevailed in the decoration. Bronze castings of the Middle Ages were largely devoted to church uses: crosses, ciboria, candelabra, baptismal fonts, reliquary holders, censers, bells, etc. Fine art work was done on bronze doors, columns, tombs, as witnessed in the Hildesheim Cathedral door panels by Bishop Bernward (1015), the Byzantine gates at Amalfi (1066), and at San Salvator, Atrani (1087), and the metal doors in San Sophia Cathedral, Nizhni-Novgorod (Russia); the equestrian statue of Saint George in Prague.

Renaissance Bronzes.— Italy made rapid strides in the bronze arts early in this period, and we have the recumbent figures of Sixtus IV, by Antonio Pollajuolo, as well as his Innocent VIII; Ghiberti's metal gates in the Florence baptistery; Benvenuto Cellini's «Nymph of Fontainebleau» and his Perseus masterpiece; also his bust of Cosimo de Medici (Florence Museum); Donatello's «Judith and Holofernes»; Giovanni da Bologna's «Neptune» at Bologna; Verrochio's «David» (Florence), and his colossal equestrian statue of General Coleoni (finished by Leopardi) at Venice, all belonging to this period. Other great Renaissance bronze artists were Sansovino, Torrigiano, Simone and Filarete, Luca della Robbia (one work only known). Many lovely medallions, plaques and pieces for household decoration belong to this great art epoch.

French Bronzes.— Under Louis XIV, France commenced an ambitious career in bronze art work. Besides church furniture she produced pieces of merit for household use such as candelabra, candlesticks, bracket clocks, vases, lovely statuettes finely chiseled, also consoles, sedan-chairs, even carriages of state received beautiful decorative inserts or mounts in delicately worked bronze-gilt devices. From Louis XIV to the Empire art in bronze was represented by such men of genius as Jacques and Philippe Caffieri, Gouthière, Thomire, Duplessis, Prieur, etc. And to this day the French have held a very high place in the bronze art world with their statuary castings, furniture fittings, mirror-frames, chimney ornaments, clocks, etc.

German Bronzes.— Peter Vischer, after his practical studies in Italy in the 16th century, brought Germany into closer line with the great Italian work in bronze. His efforts in Nuremberg, and, later, those of his sons, brought forth sepulchral monuments, statues, as well as household art materials. In the 16th century we have the second Peter Vischer, Benedict Wurzelbauer (both of Nuremberg), A. de Vries of Augsburg and P. Candido of Munich. Their bronze fountains, for instance, rank high, but baptismal fonts, candlesticks and other apparatus of the Church were added to monumental work of this century. There was a falling off in the output of large bronze pieces in the following two centuries. Germany's later founders of note were A. Schlueter, R. Donner, etc.

England's Bronzes.— Many fine old bronze statue effigies exist in Great Britain, such as the Earl of Salisbury at Salisbury (1227), the recumbent figures of Henry VI (1272) and Queen Eleanor (1291) in Westminster Abbey, by William Torrell. In Canterbury is a fine effigy of the Black Prince (1376) and in Westminster Abbey are the effigies, by Nicholas Broker and Godfrey Prest, of Richard II and his Queen (1395). In that same abbey are the effigies of Henry VII and his Queen by the Florentine, Torrigiani; also the figures of the Countess of Richmond and the Duke of Buckingham (1628).

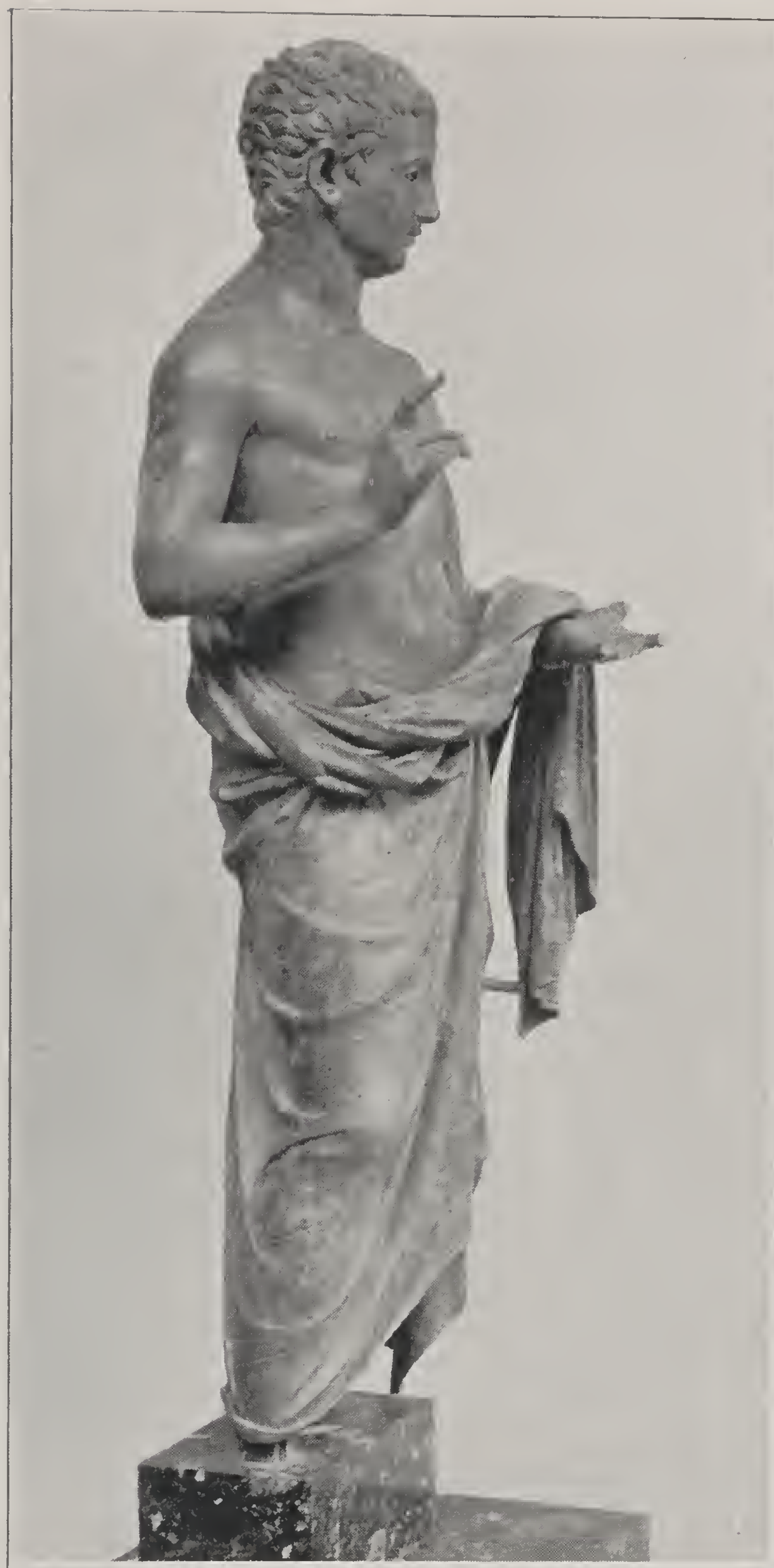
A separate group of bronzes is that of the Orient — Persia, India, China and Japan. In all Buddhist lands the casting of bronze dates back to early historic times. To this category belongs the Siam bronze termed samrit, an ancient alloy that stands severe climatic conditions in a most remarkable way for many centuries; so much so that, while the old temples have fallen into decay, they have left their old great images of Buddha enclosed in great forest trees and in perfect condition still. Large bells also have been made by Orientals since early times. See Bells.

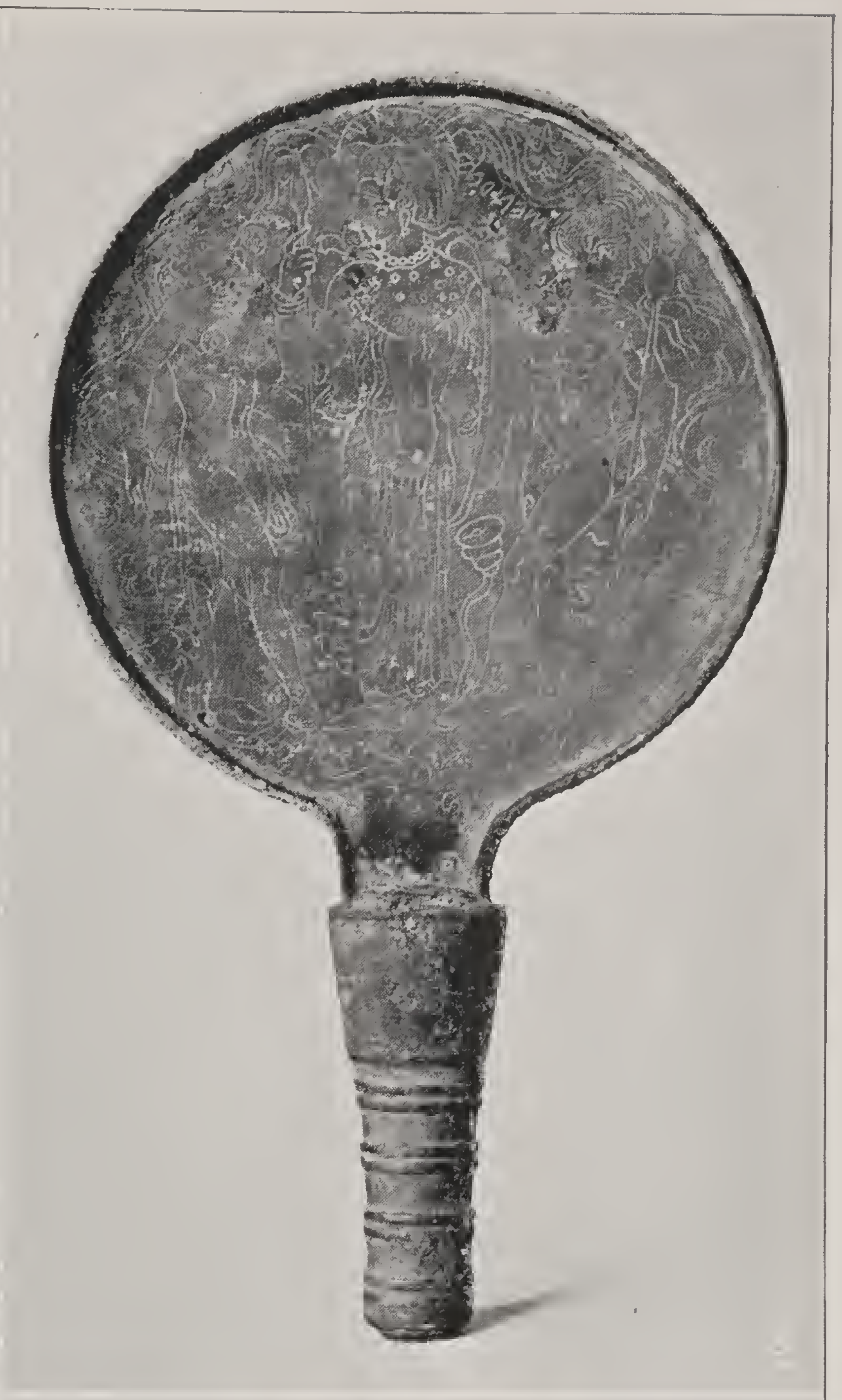
Japanese Bronzes.— No nation excels the Japanese in the art of bronze-working. During the olden times of the Daimios and the Samurai the wonderful bronze inlays, chased work, etc., in their elaborate armor and swords are present proof of their wonderful excellence in the past; their superlative modern bronze art work in the decorative arts and the extraordinary low price of the product are the admiration of the connoisseur and the despair of the Occidental manufacturer. The Japanese ability to excel in patina, fire-gilt, enamels, lacquers in bronze articles, and the originality of design and motif, have set American, as well as European, craftsmen a pace that is proving beneficial to our modern concepts of art progress. An expert of Nippon declares Japanese workers have no less than 70 different bronze alloys in which to display their diversity of production. Thirty of these alloys are still much in use. Favorites are Shakudo (deep bluish to black patina); shibuishi (silver-bronze); seido (green copper); mokumé, imitating, in metal, the grain of wood; sentokudo, an artificial copper-gold like the ancient Corinthian alloy, etc. The Japanese hira-zogwan (metal pictures in nature's colors) and ukibori (chasing) are working methods much favored. The utensils and pieces used in their cult are naturally found chiefly in Japanese old pieces such as koro (incense burner), kogo (incense box), images of their «seven gods of good-fortune,» etc. The present output is strictly industrial and consists of decorative goods made to order, with Japanese motifs, chiefly for the European and American markets.

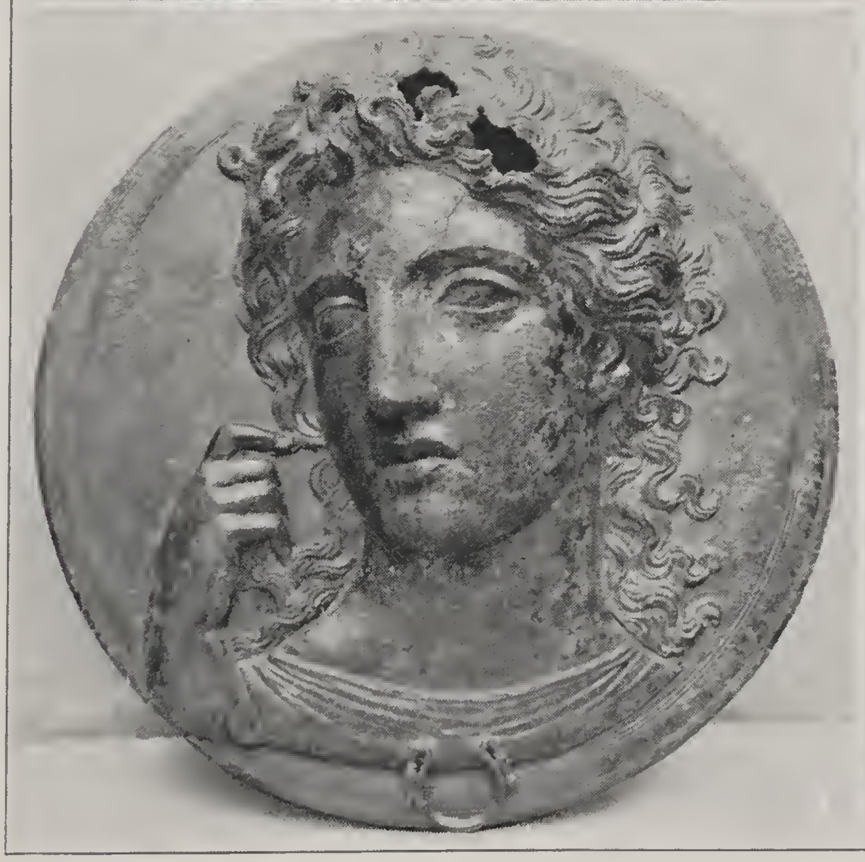
Chinese Bronzes.— In Buddhist and Brahman temples is found elegant art work in bronze ceremonial services, such as censers, bowls, vases, etc., displaying the most perfect workmanship and decoration. Household ornaments and utensils in this metal are in high demand with connoisseurs and collectors; the patina, enamel and other inlay work are greatly admired, and the peculiar yet artistic forms place their origin clearly.

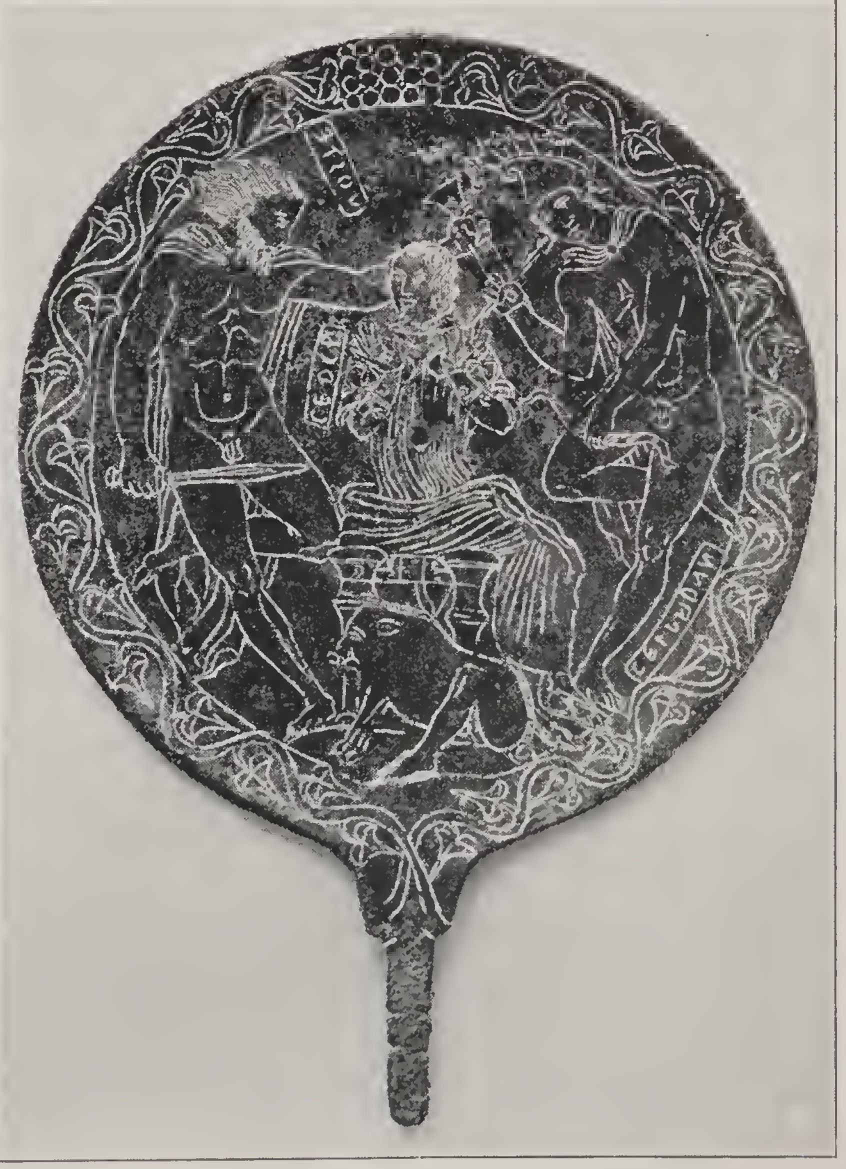
Modern Bronzes.— Of European nations Italy has led the race for producing art-bronze work. She has relied much on low-priced reproductions of antiques, but her sales have reached the world over on account of the superior quality of the workmanship. Germany's art-metal output for a number of years was reduced largely to statues, etc., in cast-iron, bronze-coated zinc, etc., till, in the seventies

BRONZES









Some Ancient Bronzes in the Metropolitan Museum of Art

1 Greek Statue. End 1st century B. C.
2 Etruscan Bronze Mirror. Incised Ornament
3 Greek Repoussé Bronze Mirror
4 Etruscan Bronze Mirror

of last century, they cultivated the use of *cuivre poli* (a species of brass). Later came true bronze art work into vogue, and statuary and decorative pieces prevailed. Noted early foundries are Royal Foundry, Berlin; Burgschmiet of Nuremberg, Stiglmayer of Munich, Howalt of Brunswick. Later, vieing with the French product, come the foundries of Gladenbach & Sons (Berlin), Miller (Munich), Stotz (Stuttgart). These factories excel in statuary. In Austria, with Vienna in the lead, we find quite an industry in household art materials (chandeliers are notable) and decorative pieces.

Belgian bronzes have been largely produced around 1870, especially in figure work, with such artists as Meunier and van der Stappen to promote them.

The United States have done valuable work in art-bronzes under such direction as the Tiffany studios and Gorhams.

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Clement Webber Coumbe.

BRONZING, a process by which a bronze-like surface is imparted to objects of metal, wood, plaster, etc. Bronze of a good quality acquires by oxidization a fine green tint, called *patina antiqua,* or by the Romans, *ærugo.* Sal-ammoniac and salt of sorrel dissolved in vinegar and applied with a soft rag or brush will produce this result. The process must be repeated several times to have its full effect. The proportions given by Dr. Ure are three-fourths of an ounce of sal-ammoniac and a drachm and a half of salt of sorrel to a quart of vinegar. A variety of liquid solutions are prepared for bronzing copper and other metals, in which verdigris, sal-ammoniac, salt of sorrel, cinnabar, alum and common salt are employed. To bronze wood and other articles, waste gold-leaf, ground in with honey and washed, or mosaic gold, ground with bone ashes, is applied, with size or oil varnish. Gypsum casts are bronzed with black-lead. The bronzing of gun-barrels may be effected by the use of a strong solution of antimony trichloride.

BRONZINO, Agnolo, or **Angelo.** See Allori.

BROOCH, an ornament worn on the dress, to which it is attached by a pin stuck through the fabric. Brooches are of great antiquity and were formerly worn by men as well as women. They were used by both sexes among the Greeks and Romans, and also in the Middle Ages. Among the Highlanders of Scotland there are preserved, in several families, ancient brooches of rich workmanship and highly ornamented. Some of them are inscribed with characters to which particular virtues were attributed, and seem to have been used as a sort of amulet or talisman.

BROOK FARM, a community organized in 1841 near West Roxbury, Mass. Under the leadership of George Ripley and his wife, an association was formed with a few stockholders and a farm of 200 acres was purchased. Among the members of this association were Nathaniel Hawthorne, Charles A. Dana, John S. Dwight and George P. Bradford; other prominent people connected with Brook Farm were Ralph W. Emerson, Amos B. Alcott, Theodore Parker, George W. Curtis and Margaret Fuller. The ideal of the Association was to promote the reorganization of society in accordance with the principles of co-operation. The life of the community was very simple; every one had some share of the work to do, the rate of pay being practically the same for all kinds of work, and all had a share in the educational advantages and the social enjoyments. There were a number of industrial employments besides the tilling of the farm, and the surplus product was sold to outsiders. The school was also an important feature, furnishing instruction in all grades, including college subjects; pupils outside the community were received on the payment of a small fee. In 1843 the Association, coming under the influence of Albert Brisbane, adopted the organization of the phalanx according to the plan of Fourier, and established the three «primary departments» of agriculture, domestic industry and mechanic arts; it became also a centre of the Fourierist propaganda and prospered until, on 3 March 1846, the new building, the Phalanstery, was burned. Enthusiasm waned with financial loss, and the Association finally dissolved in October 1847. Consult Codman, ‘Brook Farm, Historic and Personal Memoirs’ (Boston 1849); Russell, ‘Home Life of the Brook Farm Association’ (Boston 1900); Sears, ‘My Friends at Brook Farm’ (New York 1912); Swift, L., ‘Brook Farm, Its Members, Scholars and Visitors’ (New York 1900).

BROOKE, Mrs. **Frances** (née Moore), English novelist: b. 1724; d. 1789. Her husband, Rev. John Brooke, rector of Colney, Norfolk, was chaplain to the garrison at Quebec. She spent some years in Canada and published, in 1769, ‘Emily Montague,’ the first Canadian novel. Among her other works were ‘History of Lady Julia Mandeville’ (1763), and two musical entertainments, ‘Siege of Sinope’ (1781); ‘Marian’ (1788).

BROOKE, Francis Key, American Protestant Episcopal bishop: b. Gambier, Ohio, 2

Nov. 1852; d. 22 Oct. 1918. He was graduated from Kenyon College in 1874, and entering the Episcopal ministry was successively rector in the Ohio towns of College Hill, Portsmouth, Piqua and Sandusky, and in Saint Louis, Mo., and Atchison, Kan. In 1893 he was consecrated bishop of Oklahoma and Indian Territory. In 1907, on the combining of the Territory into the State of Oklahoma, he became bishop of Oklahoma. In 1910 eastern Oklahoma was made a separate district with its own bishop, but Dr. Brooke still held the title of bishop of Oklahoma. He received the degree of S.T.D. from the Kansas Theological School in 1893, D.D. from the University of the South in 1910 and from Kenyon College in 1911.

BROOKE, Henry, Irish dramatist and novelist: b. Rantavan, Ireland, about 1703; d. Burrator, Devonshire, 10 Oct. 1783. He was educated at Dublin University and began to practise at the bar; but his taste was decided for poetry and general literature, and he came forward as an author by publishing a tragedy called ‹Gustavus Vasa,› which was remarkably popular at the time and was translated into French, though it is now almost forgotten. He wrote several other tragedies and also several novels, one of which, the ‹Fool of Quality,› possesses considerable merit and was republished with a preface by Rev. Charles Kingsley. The death of his wife and the loss of a favorite child completely broke his spirit, and he lived for a short time in a state of second childhood.

BROOKE, Sir James, English rajah, celebrated as the Rajah of Sarawak: b. Bengal 1803; d. Burrator, Devonshire, 11 June 1868. He was brought at an early age to England and, having completed his education there, obtained a cadetship in the Indian army. He distinguished himself in the Burmese war (1826) and subsequently sailed to China. On this voyage there rose in his mind the idea of ridding the Eastern Archipelago from the scourge of piracy and ameliorating the condition of the inhabitants. Having come into the possession of a large fortune by the death of his father, he bought one of the royal yachts and set sail for the East (October 1838). Having directed his course to the island of Borneo, he found Muda Hassim, uncle of the King of Borneo and Rajah of Sarawak, a district on the northwest coast of the island, engaged in suppressing a revolt. The Rajah, being hard pressed, agreed to make him his successor in return for his assistance. The offer was accepted, Brooke took command of the Rajah's army and speedily reduced the rebels to submission. Being now established in the government and recognized as Rajah of Sarawak by the Sultan of Borneo (1841), he endeavored to induce the Dyak natives to abandon their irregular and piratical mode of life and to turn themselves to agriculture and commerce. For this end he published a code of laws, establishing free trade and personal equality, and declaring piracy a crime punishable with death. His efforts were wonderfully successful. In conjunction with the British naval commanders, he carried on war against the pirates with great vigor. A sum of money was paid by government for the head of each pirate, and under this system the Malay rovers were soon almost extirpated. On his return in 1847, Mr. Brooke was received with general favor, his position was recognized by the government, he received the honor of Knight Commander of the Bath and was made governor of Labuan, an island near Sarawak, which had been acquired by the British. After his return to Borneo, he continued to labor as before for the extension of British influence. In 1850 he went as Ambassador to Siam, and not long after gave up his post as governor of Labuan. On the outbreak of the war with China in 1857, his residence was suddenly attacked by about 4,000 Chinese and he himself only escaped by swimming across the river. His adherents soon rallied, however, and at the head of a large body of Malays and Dyaks he drove the Chinese from Sarawak with the loss of half their number. In 1863 he finally returned to England, leaving the government in the hands of his nephew, Charles Brooke. Whatever may be thought of the policy of Sir James Brooke, there can be no doubt as to the benefits derived from it by the people of Sarawak. He established civilization and opened up a trade where previously they had scarcely any existence. Under his administration Sarawak increased from a village of 1,000 inhabitants to a town of 16,000, while the trade increased in the same proportion.

BROOKE, John Mercer, American sailor, scientist and inventor: b. Tampa, Fla. 1826; d. 1906. With early education at Kenyon College, Gambier, Ohio, he graduated from the United States Naval Academy in 1847, and was stationed at the Naval Observatory, Washington, D. C., 1851–53. As director of the astronomical department, he was engaged on the *Vincennes* expedition in the exploration and survey of the north Pacific Ocean. He resigned from the United States navy in 1861, and in the Confederate government became chief of the Bureau of Ordnance and Hydrography. He invented a gun named after him, and directed the refitting of the *Merrimac* to meet the *Monitor* in Hampton Roads. For 33 years from 1866 to 1899 he was professor of physics at Virginia Military Institute. He was the author of numerous technical magazine articles and the Academy of Berlin conferred upon him the gold medal of science.

BROOKE, John Rutter, American military officer: b. Pottsville, Pa., 21 July 1838. He entered the army as captain in a volunteer regiment on the breaking out of the Civil War in 1861, and resigned in February 1866, with the rank of brevet major-general. He became colonel in March 1879; brigadier-general, 6 April 1888, and major-general, 22 May 1897. After the declaration of war against Spain, he was placed in command of the 1st Provisional Army Corps, and subsequently distinguished himself in the campaign in Porto Rico, and was made a member of the joint military commission to arrange the cession of the island to the United States. On 13 Dec. 1898, he was appointed military and civil governor of Cuba, a post which he held till April 1900, when he was succeeded by Gen. Leonard Wood. On 10 May following, he succeeded Maj.-Gen. Wesley Merritt as commander of the Military Department of the East, with headquarters in New York. He retired under the age rule in 1902.

BROOKE, Stopford Augustus, English clergyman and author: b. Letterkenny, Donegal, Ireland, 14 Nov. 1832; d. Ewhurst, Surrey, England, 18 March 1916. After a brilliant course at Trinity College, Dublin, he was ordained in the Anglican Church in 1857. From that year till 1859 he officiated as curate of Saint Matthew's, Marylebone (London); and in 1876, after having held various other clerical appointments, he became minister of Bedford Chapel, Bloomsbury, where he officiated till his retirement from regular ministerial work in 1894. In 1872 he was appointed one of the chaplains-in-ordinary to the Queen. Having become a Unitarian in his views he left the Church of England in 1880, but till 1894 still continued to occupy the same pulpit, Bedford Chapel being private property. He gained a high reputation as a preacher and writer on religious subjects, and also as a poet, but more especially as a literary critic and historian of English literature. His chief works are 'Life and Letters of the Late Frederick W. Robertson of Brighton' (1865); 'Christ in Modern Life' (1872); 'Theology in the English Poets' (1874); 'Primer of English Literature' (1876); 'Riquet of the Tuft' (1880), a love drama; 'The Early Life of Jesus' (1888); 'Poems' (1888); 'History of Early English Literature: from Its Beginning to the Accession of Alfred' (1892), the only work in English treating adequately its special subject; 'Tennyson: His Art and Relations to Modern Life' (1894); 'The English Poets from Blake to Tennyson' (1894); 'Jesus and Modern Thought' (1894); 'The Old Testament and Modern Life' (1896); 'The Gospel of Joy' (1898); 'English Literature to the Norman Conquest' (1898); 'On Ten Plays of Shakespeare' (1905); 'A Treasury of Irish Poetry in the English Tongue' (1901), edited in collaboration with T. W. Rolleston; 'Poetry of Robert Browning' (1902); 'Studies in Poetry' (1907); 'Four Poets' (1908); 'Onward Cry: Addresses' (1911); 'Ten More Plays of Shakespeare' (1913).

BROOKFIELD, Mo., city of Linn County, on the Chicago, Burlington and Quincy Railroad, 104 miles east of Saint Joseph. Extensive coal deposits are mined in the neighborhood; coal, cattle, grain and farm produce are largely exported along with the manufactured products of ironworks, brickyards, shoe factories, flour mills, grain elevators and railroad shops. Brookfield, settled in 1860, was incorporated in 1865, and has municipal waterworks. Pop. (1920) 6,304.

BROOKHAVEN, Miss., city and county-seat of Lincoln County, on the Illinois C. Railroad; 56 miles south of Jackson, the State capital. It is the seat of Whitworth Female College (Methodist), one of the most popular educational institutions in the South, and Saint Francis School (Roman Catholic), and is the trade centre for a large farming, cotton and yellow pine lumbering region. It has a creamery, machine shops, cotton compress, cottonseed-oil mill, lumber mills, syrup, brick and handle and spoke factories. An electric-light and power plant is owned by the city. Pop. (1920) 4,706.

BROOKINGS, S. D., city, county-seat of Brookings County, on the Chicago & N. W. Railway, 60 miles north of Sioux Falls. It is chiefly a dairying place; has electric lights, waterworks and several mills; and is the seat of the South Dakota Agricultural College and of the United States Experiment Station. Its principal industries consist in manufactures of cigars, tow, flour, cement block and automobile tire treads. Grain and live stock are produced in large quantities in the district. It was settled in 1876. Pop. (1920) 3,924.

BROOKITE, a mineral only known in the form of orthorhombic crystals. It is an oxide of titanium, having the formula TiO_2. It is found in a variety of colors, red, yellow, black and brown. It has a hardness of 5.5 to 6.0, and a specific gravity of 3.9 or 4.0. It occurs in Switzerland, in the Tyrol and in Wales. In the United States it is found (in stout black crystals known as "arkansite") at Magnet Cove, Ark.; also at Paris, Me., in Ulster County, N. Y., and in North Carolina. The mineral was named for the English mineralogist, H. J. Brooke.

BROOKLIME (*Veronica Beccabunga* and *V. americana*), two species of speedwell, perennial plants of the natural order *Scrophulariaceæ*, common in ditches and wet places in Europe and America, respectively, and attractive for their axillary racemes of bluish flowers, for which they are grown in damp places for ornamental purposes.

BROOKLINE, Mass., town in Norfolk County, on the Charles River, and the Boston & A. Railroad; three miles west of Boston, with which it is connected by electric railroad. It contains the villages of Cottage Farm, Longwood and Reservoir Station, and has a granite town house, public library (80,000 volumes), two banks and two trust companies, a school of practical arts, high school and intermediate schools, municipal baths and gymnasium, and fine parks and golf course. There are manufactories of scientific instruments and marine compasses and some others. The United States census of manufactures for 1914 reported 21 industrial establishments of factory grade, employing 429 persons, of whom 335 were wage earners, receiving annually $239,000 in wages. The capital invested aggregated $1,123,000, and the value of the year's output was $659,000; of this, $441,000 was the value added by manufacture. Brookline is chiefly a place of suburban residence, being one of the most beautiful and wealthy suburban towns in the country. It was first settled in 1634, and was known as "the hamlet of Muddy River" until its incorporation as Brookline in 1705. The government is by limited town meeting under a special form adopted in 1915. In that year the receipts amounted to $3,338,661.25, the expenditures to $3,176,578.09. The value of taxable real estate was estimated at $77,827,300, and of personal property at $46,174,600. Pop. (1910) 27,792; (1920) 37,748. Consult the 'Annual Publications of the Brookline Historical Society'; Bolton, C. K., 'Brookline: the History of a Favored Town' (Brookline 1897) and Spencer, C. A. W., 'Brookline, Chronicle Souvenir of the Bicentennial' (Brookline 1905).

BROOKLYN, Ill., town in Saint Clair County, one mile north of East Saint Louis, on the Chicago and Alton, the Wabash and the

New York Central railroads. It contains railroad repair shops and has taxable property valued at $170,000, a city hall, and two schools. It has 90 blocks of new granitoid walks. Pop. 2,200.

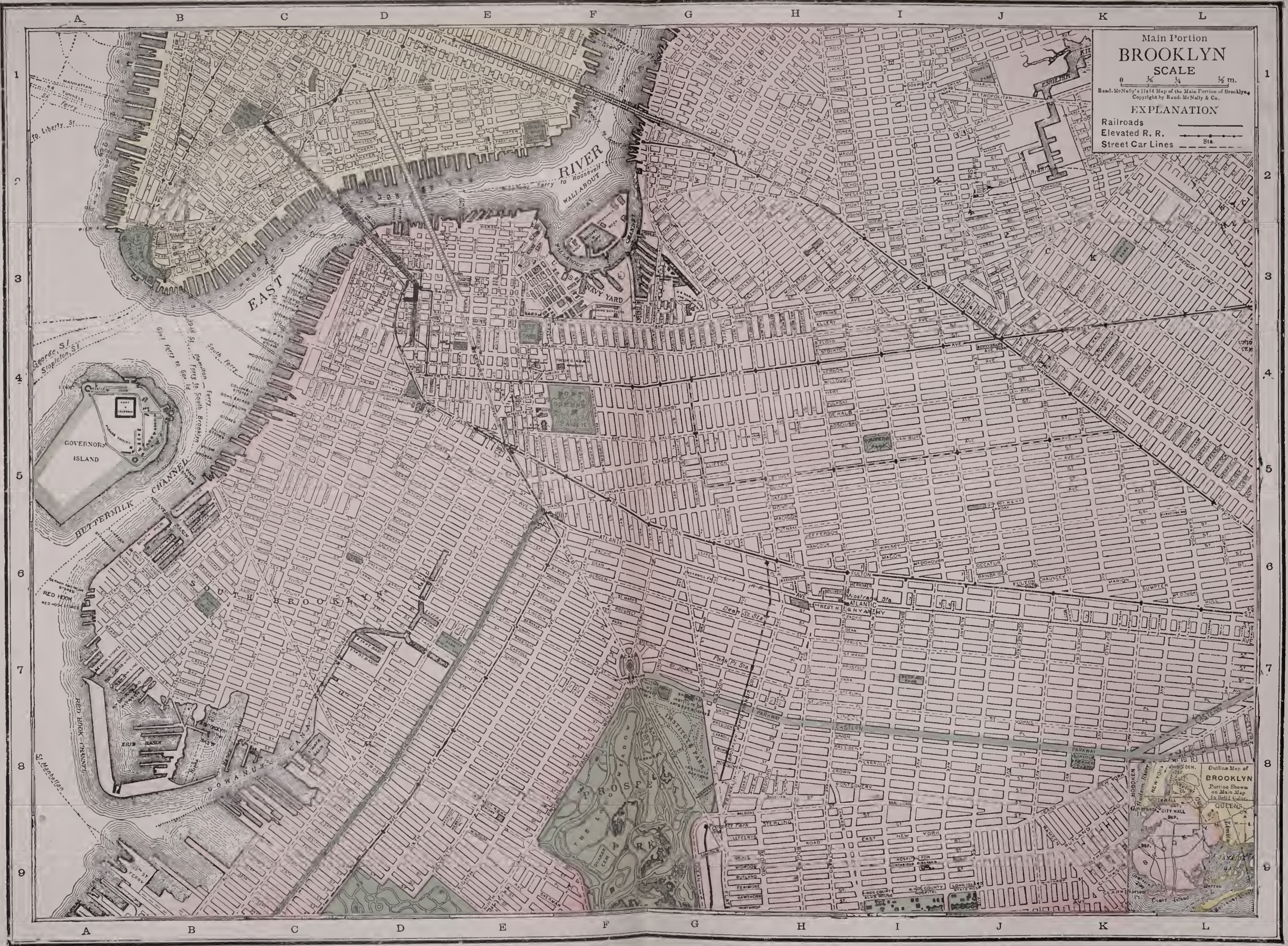
BROOKLYN, N. Y., the second largest of the five boroughs of New York city, includes the entire area of the county of Kings and was, until 1898, when it was consolidated with New York, the fourth largest city in point of population in the United States. It covers the western extremity of Long Island, in lat. 40° 41′ 50″ N., long. 73° 59′ 50″ W., and has an area of 77.52 square miles, extending from the East River, an arm of the sea which separates it from the borough of Manhattan (the old city of New York), to the Atlantic Ocean and to Newtown Creek and Queens County on the east. Its extreme length from Newtown Creek to Brighton Beach, on the Atlantic shore, is 11 miles, and its average width is over seven miles. So many natural advantages are rarely to be found within a similar area for the building up of a great industrial and commercial community. The island of Manhattan is the centre of the business activity of the American metropolis, but its restricted area limits its capacity and forbids its expansion. The tendency has been to expand skyward and to utilize to the utmost the ground area of the island by the erection of lofty buildings, many of them exceeding 20 stories in height, but there is a limit to expansion in this direction, and there seems no possibility of adding to the amount of Manhattan water front available for purposes of commerce, while the high price of land caused by the imperious demands of trade compels those engaged in business in Manhattan to seek their homes elsewhere. Brooklyn profited during the greater part of its history from this compulsion, and its population increased at a constantly accelerated ratio as the demands of business made property more valuable in the older portion of the city. After 1860 Brooklyn advanced in population more rapidly than any other American city. The period of its most rapid growth dates from the opening of the first bridge across the East River in 1883, from Park Row, Manhattan, to Sands and Washington streets. Since then the Williamsburg Bridge from Clinton street, Manhattan, to Havemeyer street, and the Manhattan Bridge from the Bowery and Canal street, Manhattan, to Nassau street have been built, and with the East River tunnel of the Interborough Rapid Transit System expedite communication with all parts of the metropolis. Brooklyn's large territorial area keeps the cost of a home within the resources of people of moderate means, especially as regards the outlying sections, which are thoroughly covered by electric surface, elevated and subway railroads. The character of the soil and the freedom from any rocky hills makes nearly every foot of ground admirably suited to building purposes. The greater part of the borough is situated at a considerable elevation above tide-water. A low range of sand-hills, from 50 to 200 feet high, runs north and east through its centre, which slopes gently down on both sides to the East River and the Atlantic Ocean.

The natural configuration of the site simplifies drainage and other similar municipal problems to a material extent, while the location of the borough, between ocean, river and bay, mitigates the extremes of winter cold and summer heat, and makes it a desirable place of residence throughout the year.

Its advantages as a centre of commerce and industry are no less than those which made it famous as a city of homes before its consolidition with the metropolis. Its water-front available for shipping comprises two miles on Newtown Creek, including its basins, and nearly 10 miles on the East River and New York Bay. The construction of large docks, such as those of the Atlantic and Erie basins — the latter being the chief point of entry of the canal barges that bring great cargoes of grain from the distributing centre at Buffalo to the Brooklyn grain-elevators — have largely increased the wharfage facilities of the borough.

Most large cities grow by the absorption of outlying suburbs and adjacent villages, and in this respect the experience of Brooklyn has been striking. The name of Brooklyn, which was derived from the town of Breucklen in Holland, the home from which came most of the earliest settlers, was first attached to a small trading-village that grew up on the shores of the East River near what is now the Fulton ferry to Manhattan. There were several other villages in the county which for a long time retained their individuality and developed along their own lines. Across the Wallabout swamp, to the eastward —“Wallabout” being derived from a settlement of Walloons — a village was laid out in 1827 which was incorporated under the name of Williamsburg and in 1851 became incorporated as a city. Then Williamsburg swallowed up the older and adjacent villages of Bushwick and Greenpoint, just as Brooklyn had already swallowed up Bedford and Gowanus. In 1854 Brooklyn and Williamsburg were consolidated. The town of New Lots, including the village of East New York, came next, and the work of absorption, as far as Brooklyn was concerned, was completed in 1894, when the towns of Flatbush, New Utrecht, Gravesend and Flatlands were made part of the city, the corporate limits of which then included all of Kings County. It was a natural process, but usually, when a large city is surrounded by suburbs that are destined to absorption, the lines of development of the suburbs are indicated and set in accordance with their inevitable destiny, and annexation entails no confusion. It was different with Brooklyn. Williamsburg, Flatbush, Canarsie, Bushwick and East New York — more than 20 villages and hamlets all told, that are now a part of the borough of Brooklyn — had each its own plan and its own system of nomenclature. The result has been hopeless and to a large extent irremediable confusion. Duplication of street names may be corrected by the substitution of new names for the old, and much has already been done in that direction, but the confusion resulting from the multiplicity of independent plans on which the various parts of the borough were originally laid out have never been wholly corrected, and Brooklyn will continue to be a puzzle to strangers and even to old residents.

It is as a city of homes — of middle-class homes — that Brooklyn has gained its distinctive character among American cities. The


Main Portion
BROOKLYN
SCALE
0 ⅛ ¼ ½ m.
Rand-McNally's 11x14 Map of the Main Portion of Brooklyn.
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EXPLANATION
Railroads
Elevated R. R.
Street Car Lines
Sta.
Outline Map of
BROOKLYN
Portion Shown on Main Map in Solid Color.
QUEENS
HOBOKEN
Hudson River
NEW YORK
CITY HALL
A
B
C
D
E
F
G
H
I
J
K
L
1
2
3
4
5
6
7
8
9
EAST RIVER
WALLABOUT BAY
NAVY YARD
GOVERNORS ISLAND
BUTTERMILK CHANNEL
RED HOOK
RED HOOK CHANNEL
ERIE BASIN
GOWANUS CANAL
SOUTH BROOKLYN
PROSPECT PARK
FORT GREENE PARK
TOMPKINS PARK
BEDFORD PARK
LINCOLN TERRACE PARK
South Ferry
Hamilton Ferry
Fulton Ferry
Ferry to Roosevelt St.
Williamsburg Bridge
Manhattan Tunnels
St. George, S.I.
Stapleton, S.I.
Govt Ferry to Gov Id
to Liberty St.
St. Manhattan
FULTON
ATLANTIC
MYRTLE
FLUSHING
BROADWAY
EASTERN PARKWAY
BEDFORD
NOSTRAND
FLATBUSH
KINGS COUNTY HOSPITAL
Nostrand Sta.
Dean St. Sta.
Park Pl Sta.
Prospect Park

very wealthy can afford to live in Manhattan, and the very poor have no alternative but to crowd into its hive-like tenements, but it may be said that, as a rule, the palace and the tenement — using the latter word in its ordinary, not its technical sense — are alike unknown in Brooklyn. No place of like population is freer from those congregations and nurseries of crime and disease known as «slums,» and in no city is a larger proportion of the population housed under decent and sanitary conditions. It is for this reason, and because the growth of Brooklyn has kept pace in other respects with its growth in numbers, that the population increased from 279,122 in 1860 to 599,495 in 1880; 1,166,582 in 1900, 1,634,351 in 1910 and 2,022,262 in 1920.

The earliest settlement of the Dutch in Kings County was made in 1619, but it was not until more than a century later that Brooklyn had any organized existence. It was the scene of Washington's first battle and defeat during the American Revolution. That battle was fought only about six weeks after the American Congress in Philadelphia had adopted the Declaration of Independence. Washington's army, as yet raw and totally unused to warfare, was massed among Brooklyn's hills, while General Howe, with 30,000 seasoned fighting men, occupied Staten Island. The British crossed to Long Island, landing on the plains of New Utrecht, and on the morning of 27 Aug. 1776, a general advance was made on the American lines. The attack was made at three points. One division advanced through the marshes of Gowanus, and, despite a gallant resistance, drove back the Maryland regiment to the main body of American troops. A second point of attack was through what is now known as Battle Pass, in Prospect Park, where the Americans were forced back on the entrenched position at Fort Green, but the heaviest blow was struck through the advance of a strong flanking party. It had early that morning passed along the northern base of the ridge of hills in what is now the Twenty-fourth ward, stopping at the Howard House, a tavern in East New York, and impressing its owner as a guide. It then advanced upon Washington's forces from the east. A misty night fell, with no general engagement, and by morning Washington had withdrawn his troops, under cover of fog, across the East River. The British retained possession of Brooklyn until the evacuation of New York at the close of the war. Brooklyn's most memorable association with Revolutionary history, however, lies in the fact that the British prison ships — the *Jersey* and its consorts — were moored in Wallabout Bay, and the bones of 11,000 victims who died in those floating slaughter-pens are buried at Fort Green, where a monument to their patriotic devotion is erected.

Brooklyn was incorporated as a village in 1801, and at about that time the Federal government made its first purchase of land at the Wallabout for navy-yard purposes. The Brooklyn navy yard is now the best equipped in the possession of the United States government. It covers an area of over 100 acres, with a capacious drydock, and a mechanical plant capable of ship-building on the most extensive scale. Some of the finest ships in the United States navy have been constructed here, and its great repair shops are kept constantly at work. A splendidly equipped naval hospital occupies a fine site in connection with the yard.

Brooklyn village was incorporated as a city in 1834, with George Hall as its first mayor. In 1854 came consolidation with Williamsburg, and thereafter the growth of the city was steady and rapid. Street railway enterprises opened highways through outlying farm districts, and these speedily became transformed into great thoroughfares, and Brooklyn has now 1,230 miles of streets, of which the principal ones are paved with asphalt.

The surface, elevated and subway railroad lines, all operated by electricity, have 655 miles of tracks and carry annually about 600,000,000 passengers.

Industries.— It has been generally assumed that Brooklyn is merely «the sleeping-place of Manhattan.» It is undoubtedly true that many thousands of those who are engaged in business in Manhattan find their homes in Brooklyn — the number has been estimated at between 100,000 and 200,000 — but the fact remains that Brooklyn itself is one of the greatest manufacturing centres of the United States. In many important branches of industry it leads all its competitors. Its most important industry is foundry and machine-shop products. Brooklyn's sugar-refining industry is by far the most important in the United States, nine-tenths of the sugar consumed in the country being refined here. Coffee-roasting is another large and important industry, as is the manufacture of chemicals. Some of the leading publishers of the United States have located their printing and bookbinding establishments in Brooklyn. It is also the seat of jute manufacture, glass and porcelain factories, cordage works and other important industries. The United States census of manufactures for 1914 reported 6,096 industrial establishments of factory grade, employing 106,740 persons, of whom 140,881 were wage-earners, receiving $81,910,000 annually in wages. The capital invested aggregated $448,757,000, and the year's production was valued at $515,303,000; of this, $217,034,000 was the value added by manufacture.

Education.— Brooklyn's public school system, up to the date of consolidation with New York, held a high place in the esteem of public educators. In 1897 it was merged in the public-school system of the greater city, but it still possesses many of the characteristics that formerly distinguished it, and few if any cities in the world have a better equipped galaxy of public schools. It has six high schools, of which one is devoted to manual and technical instruction, while another is wholly given over to commercial instruction. Its 180 public schools are crowded almost beyond their capacity every day in the school year. Many of the schools in the poorer neighborhoods are kept open during the summer months as recreation schools for the benefit of children who remain in the borough during the ordinary school vacation and who are taught many things outside of the ordinary school curriculum. Brooklyn has more than 328,000 pupils registered in her public schools and 7,900 teachers.

Brooklyn has no university but it has many excellent private schools and academies, some of which, such as the Polytechnic Institute, Adelphi Academy and Saint John's College, hold collegiate rank and grant degrees. The parochial schools also hold high rank, while the Pratt Institute affords thorough technical training to hundreds of pupils.

The Brooklyn Public Library, with which the excellent Brooklyn Library was incorporated, maintains 31 branch libraries throughout the borough, including 20 presented by Mr. Andrew Carnegie.

One of the most notable of the educational institutions in Brooklyn is the Brooklyn Institute of Arts and Sciences. This valuable and practically unendowed institution is, as regards its present buildings, situated upon high ground adjacent to Prospect Park, on what is known as the East Side Park lands, of which 11 9/10 acres have been leased to the trustees for 100 years. It is the development of a school of arts and sciences founded during the middle of the 19th century by Augustus Graham, a philanthropist of English extraction. It expanded under the direction of the late Prof. Franklin W. Hooper and a public-spirited board of trustees into what is likely to prove the nucleus of a great national academy. It has a well-furnished museum, which is especially rich in prehistoric American relics, and departments of archæology, architecture, astronomy, botany, chemistry, domestic science, electricity, engineering, entomology, geography, geology, law, mathematics, microscopy, mineralogy, music, painting, pedagogy, philology, philosophy, photography, physics, political science and psychology, each of which is presided over by an expert in the science. When completed the entire structure will cover a large area, with four interior courts to provide light for the central portions of the building. It will contain on the first floor rooms for collections illustrating the general history of the arts and architecture, on the second floor rooms for the illustration of the practical arts and sciences and on the third floor galleries for the illustration of the history of painting, engraving, etching and decorative art.

Parks.— Brooklyn's public park system has been developed on a scale altogether commensurate with the character of the borough, and full advantage has been taken of the cheapness of land to make provision for the needs of the future in the matter of breathing places and pleasure grounds. The oldest and best known, although not the largest of these, is Prospect Park, which includes 516 acres of rolling land, with picturesque lakes and an unrivaled growth of old forest trees. Prospect Park is beautifully laid out, special care having been taken during the 40 years of its existence as a park to preserve its natural characteristics. Its statuary includes figures of J. S. T. Stranahan, one of the pioneers in the matter of providing public parks; John Howard Payne, Thomas Moore, Washington Irving, Beethoven and Mozart. There is also, at the foot of Lookout Hill, a memorial shaft in honor of the Maryland soldiers who fell in the battle of Long Island.

Another notable pleasure ground is Forest Park at Richmond Hill, which includes 536 acres on the crown of the ridge of hills on the Queens County border. Except for the laying out of walks, paths and golf links, it has been left in its natural state. It affords splendid views of the Atlantic Ocean and Jamaica Bay. Sunset Park, a reserve of 14 acres on the shores of New York Bay, and the Coney Island Concourse, which runs along the Atlantic shore and contains 70 acres, are unique in their location. In addition, there are nearly 40 small parks and recreation grounds in the borough.

Bibliography.—'Brooklyn, the Borough of Beauty and Promise — the Home Borough of New York City' (Municipal Club of Brooklyn 1912); Edwards, R., 'Historical and Descriptive Review of the City of Brooklyn' (New York 1883).

Charles Leonard-Stuart,
Editorial Staff of The Americana.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES. See Brooklyn.

BROOKLYN POLYTECHNIC INSTITUTE, an institution founded in 1835, which gives college preparatory training and a college engineering course. The latter course is given during the day and evening and affords a training for engineers and chemists. Certificates from the accredited schools are accepted for admission. Degrees are given in chemistry, chemical, mechanical, civil and electrical engineering. A graduate department is also maintained. The faculty consists of 14 professors and 27 instructors and assistants.

BROOKS, Alfred Hulse, American geologist, Alaskan explorer and author: b. Ann Arbor, Mich., 18 July 1871. He studied at Harvard University, in Germany and Paris; in 1898 became assistant geologist in the United States Geological Survey, engaged in geological work and exploration in Alaska, and was appointed geological curator of Alaskan mineral resources 1902. His publications include 'Railway Routes in Alaska' (1907); 'Mining and Mineral Wealth of Alaska' (1909); 'The Mount McKinley Region, Alaska' (1911); 'Gold, Silver, Copper, Lead and Zinc in Western States and Alaska' (1913).

BROOKS, Charles William Shirley, English journalist, editor of *Punch*: b. London, 29 April 1816; d. there, 23 Feb. 1874. He settled in London, wrote dramas, contributed to the leading periodicals and journals, and for five sessions wrote the 'Parliamentary Summary' for the *Morning Chronicle.* By its proprietors he was sent, in 1853, on a mission to report on the condition of labor and the poor in Russia, Syria and Egypt, and a result of his observations appeared in 'The Russians of the South' (1856). He wrote political articles, attracted attention by several dramas and burlesques and in 1854 joined the staff of the London *Punch.* In 1870 he succeeded Mark Lemon as its editor. His novels, which include 'Aspen Court' (1855); 'The Gordian Knot' (1860); 'The Silver Cord' (1861); 'Sooner or Later,' with illustrations by Du Maurier (1866–68); 'The Naggeltons' (1875), show keen observation. He also wrote 'Amusing Poetry' (1857). His son, Reginald Shirley, collected Brooks' 'Wit and Humor from Punch' (1875).

BROOKS, Elbridge Streeter, American author, son of Elbridge Gerry Brooks: b. Lowell, Mass., 14 April 1846; d. Somerville, Mass., 7 Jan. 1902. He was the author of more than 40 books for young people, intended to

Water Tower and Entrance to Prospect Park

Memorial Arch, Plaza Entrance to Prospect Park

familiarize them with American history, among which are ‹Historic Boys›; ‹Chivalric Days›; ‹The Story of the American Indian›; ‹The Story of New York›; ‹Heroic Happenings› (1893); ‹The True Story of George Washington› (1895); ‹The Century Book of Famous Americans› (1896); ‹Stories of the Old Bay State› (1899); ‹A Godson of Lafayette› (1900); ‹Under the Allied Flags› (1901). He edited the *Wide Awake Magazine* for several years, and was the literary adviser of the Boston publishing house of D. Lathrop Company from 1895 until his death.

BROOKS, James Gordon, American poet: b. Claverack, N. Y., 3 Sept. 1801; d. Albany, 20 Feb. 1841. He studied law, and removed in 1823 to New York, where he became editor of the *Minerva,* a literary journal, and afterward of the *Literary Gazette,* the *Athenæum* and the *Morning Courier,* continuing in all these papers the publication of his verses. In 1828 he married Mary Elizabeth Aikin, who had written under the signature of Norma, and the next year appeared the ‹Rivals of Este, and Other Poems, by James G. and Mary E. Brooks.›

BROOKS, John, American soldier, and governor of Massachusetts: b. Medford 1752; d. 1 March 1825. While pursuing the study of medicine he displayed a love for military exercises, and having settled as a medical practitioner at Reading undertook the drilling of a company of minute men, with whom, on the news of the expedition to Lexington, he marched in time to see the retreat of the British. Promoted soon after to the rank of major in the Continental service, he assisted in throwing up the fortifications on Breed's Hill, and was especially serviceable to the army as a tactician. He was made lieutenant-colonel in 1777, and in the battle of Saratoga stormed the entrenchments of the Hessian troops. He was a faithful adherent of the commander-in-chief during the conspiracy at Newburg. Washington requesting him to keep his officers within quarters, that they might not attend the insurgent meeting, his reply was: «Sir, I have anticipated your wishes, and my orders are given.» Washington took him by the hand, and said: «Colonel Brooks, this is just what I expected from you.» After the peace he resumed the practice of the medical profession in Medford, and was for many years major-general of the militia of his county. In the War of 1812 he was adjutant-general of Massachusetts, and in 1816 was elected governor of that State, an office to which he was re-elected annually till 1823, when he declined being again a candidate.

BROOKS, John Graham, American lecturer on economics: b. Acworth, N. H., 19 July 1846. He was graduated from the Harvard Divinity School in 1875, and subsequently studied in the universities of Berlin, Jena and Freiburg. He was for a time in the work of the Unitarian ministry, and was for several years a lecturer in the extension department of the University of Chicago, also in the economic department at the University of California. For two years he served as an expert in the Department of Labor at Washington, making a report in 1893 upon workingmen's insurance in Germany. For 16 years he was president of the National Consumers' League. He published ‹Charity and the Unemployed›; ‹The Pope and the Encyclical on Labor›; ‹The Social Unrest› (1903) ‹As Others See Us› (1908); ‹An American Citizen› (1910); ‹American Syndicalism› (1913).

BROOKS, Noah, American journalist and author: b. Castine, Me., 30 Oct. 1830; d. Los Angeles, Cal., 16 Aug. 1903. From 1850 he was connected with newspapers in Massachusetts, California, Washington and New York. He published many popular books for boys, among which are ‹The Fairport Nine› (1880); ‹Our Baseball Club› (1884); ‹How the Republic is Governed›; ‹American Statesmen› (1893); ‹Short Stories in American Party Politics› (1896); ‹The Boys of Fairport›; ‹The Mediterranean Trip.›

BROOKS, Peter Chardon, American merchant: b. Medford, Mass., 6 Jan. 1767; d. Boston, 1 Jan. 1849. He began his business career as secretary in a marine insurance office in Boston, and presently became its principal. He rapidly acquired a fortune, retiring in 1803, and for the remainder of his life took an active interest in municipal and philanthropic affairs. He was the president of several benevolent associations, a member of the first city council of Boston and sat in both houses of the State legislature. He was one of the most prominent opponents of the lottery schemes then countenanced by many respectable persons. One of his daughters married Rev. H. L. Frothingham (q.v.), and several prominent Boston families of to-day claim him as an ancestor. Consult Everett, ‹Life of Peter C. Brooks.›

BROOKS, Phillips, American Protestant Episcopal bishop: b. Boston, Mass., 13 Dec. 1835; d. there, 23 Jan. 1893. He inherited the best traditions of New England history, being on the paternal side the direct descendant of John Cotton, and his mother's name, Phillips, standing for high learning and distinction in the Congregational Church. Born at a time when the orthodox faith was fighting its bitterest battle with Unitarianism, his parents accepted the dogmas of the new theology, and had him baptized by a Unitarian clergyman. But while refusing certain dogmas of the orthodox Church they were the more thrown back for spiritual support upon the internal evidences of evangelical Christianity. Transition to the Episcopal Church was easy; the mother became an Episcopalian, and the future bishop received all his early training in that communion. But heredity had its influence, and in after life he declared that the Episcopal Church could reap the fruits of the long and bitter controversy which divided the New England Church only as it discerned the spiritual worth of Puritanism and the value of its contributions to the history of religious thought and character. Such were the early surroundings of the man, and the subsequent influences of his life tended to foster this liberal spirit. When he entered Harvard, he came into an atmosphere of intense intellectual activity. James Walker was the president of the college, and Lowell, Holmes, Agassiz and Longfellow were among the professors. He graduated with honor in 1855, and soon after entered the Episcopal Theological Seminary at Alexandria, Va. The transition from Harvard to this college was an abrupt one. The standards of the North and South were radically different. The theology of the Church in Virginia, while tolerant to that of other denominations, was uncompromisingly hostile to what it regarded as heterodox.

When the Civil War was declared he threw himself passionately into the cause of the Union. Yet his affection for his Southern classmates, men from whom he so widely differed, broadened that charity that was one of his finest characteristics, a charity that respected conviction wherever found. No man, in truth, ever did so much to remove prejudice against a Church that had never been popular in New England. To the old Puritan dislike of Episcopacy and distrust of the English Church as that of the oppressors of the colony was added a sense of resentment toward its sacerdotal claims and its assumption of ecclesiastical supremacy. But he nevertheless protested against the claim by his own communion to the title of «The American Church.» He preached occasionally in other pulpits, he even had among his audiences clergymen of other denominations and he was able to reconcile men of different creeds into concord on what is essential in all. The breadth and depth of his teaching attracted so large a following that he increased the strength of the Episcopal Church in America far more than he could have done by carrying on an active propaganda in its behalf. His first charge was the church of the Advent, in Philadelphia; in two years he became rector of Holy Trinity Church in the same city. In 1869 he was called to Trinity Church, Boston, of which he was rector until his election as bishop of Massachusetts in 1891.

It is impossible to give an idea of Phillips Brooks without a word about his personality, which was almost contradictory. His commanding figure, his wit, the charm of his conversation and a certain boyish gayety and naturalness drew people to him as to a powerful magnet. He was one of the best-known men in America; people pointed him out to strangers in his own city as they pointed out the Common and the Bunker Hill monument. When he went to England, where he preached before the Queen, men and women of all classes greeted him as a friend. They thronged the churches where he preached, not only to hear him but to see him. It was said of him that as soon as he entered a pulpit he was absolutely impersonal. There was no trace of individual experience or theological conflict by which he might be labeled. He was simply a messenger of the truth as he held it, a mouthpiece of the Gospel as he believed it had been delivered to him. Although in his seminary days his sermons were described as vague and unpractical, he was as great a preacher when under 30 years of age as at any later time. His early sermons, deliverd to his first charge in Philadelphia, displayed the same individuality, the same force and completeness and clearness of construction, the same deep, strong undertone of religious thought, as his great discourses preached in Westminster Abbey six months before his death. His sentence were sonorous; his style was characterized by a noble simplicity, impressive, but without a touch showing that dramatic effect was strained for. He passionately loved nature in all her aspects, and traveled widely in search of the picturesque; but used his experience with reserve, and his vivid illustrations to explain human life. His treatment of Bible narratives is not a translation into the modern manner, nor is it an adaptation, but a poetical rendering, in which the flavor of the original is not lost though the lesson is made contemporary. He used figures of speech and drew freely on history and art for illustrations, but not so much to elucidate his subject as to ornament it. As might be expected of one who, in the world's best sense, was so thoroughly a man, he had great influence with young men and was one of the most popular of Harvard preachers. It was his custom for 30 alternate years to go abroad in the summer, and there, as in America, he was regarded as a great pulpit orator. He took a large view of social questions, and was in sympathy with all great popular movements. His advancement to the episcopate was warmly welcomed by all parties, except one branch of his own Church with which his principles were at variance, and every denomination delighted in his elevation as if he were the peculiar property of each. His works include ‹Lectures on Preaching› (1877); ‹Sermons› (1878–81); ‹Bohlen Lectures› (1879); ‹Baptism and Confirmation› (1880); ‹Sermons Preached in English Churches› (1883); ‹The Oldest Schools in America› (Boston 1885); ‹Twenty Sermons› (New York 1886); ‹Tolerance› (1887); ‹The Light of the World, and Other Sermons› (1890); and ‹Essays and Addresses› (1894). His ‹Letters of Travel› show him to have been an accurate observer, with a large fund of spontaneous humor. Consult Allen, ‹Life and Letters of Phillips Brooks›; Howe, ‹Phillips Brooks› (1902).

BROOKS, Preston Smith, American politician and legislator: b. Edgefield, S. C., 4 Aug. 1819; d. Washington, D. C., 27 Jan. 1857. He was graduated at South Carolina College in 1839; elected to the legislature of his native State in 1884; raised a company for the Mexican War and led it as captain in the famous Palmetto regiment. He was sent to Congress in 1853, made his first speech in February 1854, on the subject of the Nebraska bill; speaking also in June of the same year on the Pacific Railroad bill. On 22 May 1856, Senator Sumner, of Massachusetts, having employed in a speech in the Senate various expressions which had greatly incensed the members of Congress from South Carolina, Brooks entered the Senate chamber, after the Senate had adjourned, while Sumner was seated at his desk engaged in writing, and with blows on the head from a gutta-percha cane struck the Senator to the floor, where he left him insensible. On 2 June a committee of the House of Representatives reported in favor of Mr. Brooks' expulsion. In the final action upon the report there were 121 votes in favor of and 95 opposed to it, which, being less than the requisite two-thirds vote, prevented the House from agreeing to the resolution. Mr. Brooks, however, resigned his seat, and, 8 July, pleaded guilty before the court at Washington upon an indictment for assault, and was sentenced to a fine of $300. Having addressed his constituents on the subject of the assault, he was re-elected to Congress by a unanimous vote, and made, on 7 Jan. 1857, a second speech on the Nebraska bill.

BROOKS, Shirley. See BROOKS, CHARLES WILLIAM SHIRLEY.

BROOKS, William Keith, American zoologist: b. Cleveland, Ohio, 25 March 1848; d. Baltimore, Md., 12 Nov. 1908. He was professor of zoology in Johns Hopkins University from 1876. He wrote 'Handbook of Invertebrate Zoology' (1882); 'Heredity' (1884); 'The Development and Protection of the Oyster in Maryland' (1884); 'A Monograph of the Genus Salpa' (1893); 'Foundation of Zoology' (1898).

BROOKS, William Robert, American astronomer: b. Maidstone, Kent, England, 11 June 1844; d. Geneva, N. Y., 3 May 1921. He was educated in the United States, became an expert mechanical draughtsman, and in 1874 founded the Red House Observatory at Phelps, N. Y., where he discovered 11 comets. After 1888 he was in charge of the Smith Observatory at Geneva, N. Y., where he discovered 12 more comets. In 1887 he was elected a fellow of the Royal Astronomical Society of Great Britain. He was a popular lecturer on astronomical subjects and had considerable reputation as an astronomical photographer.

BROOKVILLE, Ind., town and county-seat of Franklin County, 65 miles southeast of Indianapolis, on the Cleveland, Cincinnati, Chicago and Saint Louis Railroad, and on the White Water River. Its industrial establishments comprise furniture factories, flour mills, paper and saw mills. The waterworks are municipal property. The town has a Carnegie library. Pop. 2,169.

BROOKVILLE, Pa., borough and county-seat of Jefferson County, 100 miles northeast of Pittsburgh, on the Pennsylvania, the Pittsburgh, Shawmut and Northern, and the New York Central railroads, and on Red Bank Creek. The Brookville Memorial Home for the widows of sailors and soldiers is located here. The borough has iron foundries, flouring mills, glass-works, lumber-dressing works, brick and tile works, furniture and automobile factories. It owns the waterworks. Pop. 3,003.

BROOM, various shrubs of the closely allied genera *Genista, Cytisus* and *Spartium,* of the family *Fabaceæ,* natives mostly of the warm and temperate parts of the Old World. The name is applied only to species which have long, slender twigs and numerous axillary flowers. *Genista monosperma,* a Spanish and North African species, attains a height of 10 feet; has almost leafless, grayish branches; small, simple, linear, silky leaves; fragrant white flowers in short lateral racemes; and one-seeded pods. It is planted in shrubberies and is grown in greenhouses in preferably loose, dry soil. *G. tinctoria,* dyer's greenweed, a native of Europe and western Asia, is an erect shrub about three feet tall with somewhat pubescent branches and many flowered axillary racemes which are terminally panicled. Its branches, leaves and blossoms are used to dye wool yellow, or when mixed with wood, green, *Cytisus sooparius,* Scotch or common brown, a native of middle and southern Europe, attains a height of 20 feet, but usually much less, has erect slender branches short-petioled leaves, generally large, solitary, long-stalked, drooping yellow flowers and brownish black pods. It has been largely introduced into the United States for ornament, and is hardy as far north as Nova Scotia. It succeeds on dry soils, and produces an abundance of bloom in late spring and early summer. The stems and leaves, which are very bitter and nauseous tasting and smelling, have been used in dyeing and tanning, and the fibre of the former used to make cloth and paper. The wood of large specimens is highly valued for turning and cabinetmaking. *C. albus,* white or Portugal broom, a native of the Mediterranean region, which attains a height of three feet, sometimes even 20 feet, has fascicles of axillary flowers, for which it is frequently planted in shrubberies. Many other species are valued for ornamental planting, for pasturage, and since their flowers yield abundant nectar, for bee forage. *Spartium junceum,* Spanish broom, a native of southern Europe, is an upright shrub, 10 feet tall, with slender, green branches, fragrant yellow flowers which appear continuously during summer, and in California, where the plant has been introduced, almost throughout the year. It grows on dry soils and in rocky places. Its fibre is used to some extent in Spain, Italy and France for rope- and cloth-making and even for making some kinds of lace. See CYTISUS; GENISTA; SPARTIUM.

BROOM-CORN, (*Holcus sorghum* var. millet or Guinea-corn), a plant of the grass family with a jointed stem, rising to the height of 8 or 10 feet, extensively cultivated in North America, where the branched panicles are made into carpet-brooms and clothes-brushes. The seed is used for feeding poultry, cattle, etc.

BROOM RAPE (*Orobanche ramosa*), an annual parasitic plant of the family *Orobanchaceæ,* a native of Europe but established in America, especially in tobacco and hemp fields, where it often does damage by sucking the juices of the plants which it eventually kills. Its slender, brownish or straw-colored stems attain a height of 6 to 15 inches, bear small scales instead of leaves, and light blue sessile flowers, followed by an abundance of minute seeds which rapidly spread the pest. Several closely related species also occur in the United States, parasitic upon clover and various other plants.

BROOM-SEDGE. See ANDROPOGON.

BROOM TOPS, the fresh and dried tops of *Cytisus scoparius* (common broom). There are two official preparations; the decoction (*decoctum scoparii*), consisting of a pint of distilled water to an ounce of the dried tops, and the juice (*succus scoparii*), made of three ounces of the fresh expressed juice to a pint of rectified spirits. They are valuable diuretics, especially in cardiac dropsies. Scoparine and sparteia are the two active principles; the action of sparteia is analogous to that of conia.

BROOMS. See BRUSHES AND BROOMS.

BROSBÖLL, Karl. See ETLAR, CARIT.

BROSE (Gaelic *brothas*), a dish sometimes used in Scotland, made by pouring boiling water, milk or the liquor in which meat has been boiled, on oatmeal, and mixing the ingredients by immediate stirring. Butter may be added, and sweet milk when the brose is made with water. It is kail brose, water brose or beef brose, according to the liquid used. Athole brose, a famous Highland cordial, is a compound of honey and whisky.

BROTHER JONATHAN, a name of personification applied to the people of the United States, as «John Bull» is to the people of England. The most widely accepted explanation of its origin rests on the tradition that Washington, on assuming command of the New England Revolutionary forces, being in great straits for arms and war material, and having a high regard for the judgment of his friend the governor of Connecticut, Jonathan Trumbull, said in that emergency, «We must consult Brother Jonathan.» This expression, being repeated on other difficult occasions, came into common use, and at last was extended to the entire people of the country. See NATIONAL NICKNAMES.

BROTHERHOOD OF AMERICAN YEOMEN. A fraternal beneficiary society with headquarters at Des Moines, Iowa, organized under the laws of the State of Iowa in February 1897. The purpose of this organization is to unite in a fraternal association all acceptable white persons between the ages of 18 and 45, at nearest birthday, under a lodge system and ritualistic form of work. It pays to its members or their beneficiaries, death and disability benefits either as a result of disease, accident or old age. The Society has a representative form of government, the governing body being known as the Supreme Conclave, which meets quadrennially and which is composed of representatives duly elected thereto. The affairs of the Association are managed by a board of directors consisting of five members elected by the Supreme Conclave. On 1 July 1916, the Society had a membership of 225,153; assets totaling $3,541,925.11, and claims paid since organization, $14,611,184.33.

BROTHERHOOD OF ANDREW AND PHILIP, The, is an international and interdenominational fraternity within the Church advocating prayer, service, Bible study and the spread of Christ's kingdom seeking to cultivate the working interests of every man in the Church. The first chapter was organized 4 May 1888. The idea of the Brotherhood is simplicity itself. Its object is to bind men together in Christian fellowship and religious work. Its fundamentals are the two rules of prayer and service. The rule of prayer is to pray daily for the spread of Christ's kingdom among men and for God's blessing upon the labors of the Brotherhood. The rule of service is to make personal efforts to bring men and boys within the hearing of the gospel of Jesus Christ, as set forth in the services of the Church, prayer meetings and men's Bible classes. This being the simple nucleus of its activities, the Brotherhood is not restricted in its development. But in all that it does it holds in view the fact embodied in its constitution, namely, that the sole object of the Brotherhood is the spread of Christ's kingdom among the youth and older men. The word «men» is used in its broad sense, and means any male over the age of 16. Every chapter is a society of the local church. None should be chartered without the approval of the pastor. Every member is expected to be loyal to his own denomination. But the Brotherhood is interdenominational, in that each chapter affiliates with chapters in other denominations, for the purpose of fellowship, extension and growth.

BROTHERHOOD OF SAINT ANDREW, a religious organization of the Protestant Episcopal Church, founded in 1883, in Saint James' Parish, Chicago. It has more than 1,200 active chapters, exclusive of the junior department, with a membership of about 13,000 men. The junior department has 500 chapters and a membership of about 4,000. The Society has extended to Canada, England, Scotland, Australia, the West Indies and South America. In Canada there are 300 chapters with a membership of about 3,000. The official organ of the brotherhood is *Saint Andrew's Cross,* published monthly. There are two rules, one of prayer and one of service. The pledge of service binds every member to make an earnest effort to bring at least one young man each week within the hearing of the gospel. The headquarters of the Association is at Boston, Mass.

BROTHERHOODS, Religious. See ORDERS, RELIGIOUS.

BROTHERS OF CHARITY, a congregation founded for the purpose of securing the sanctification of its members by the practice of the three simple vows and the observance of its constitution. Its special object is the ministry of charity in maintaining and ministering to the aged, the sick and the insane, in sheltering the poor, in educating poor children and performing any other work of charity to which they may be called. The congregation was founded in Belgium about 1809 by Rev. I. Triest, canon of Saint Bavon, Ghent.

BROTHERS OF THE CHRISTIAN INSTRUCTION, a Roman Catholic Institute founded at Saint Brieuc, France, by the Abbé Jean Marie de le Mennais, and approved by the Holy See in 1891. The Order was established in Canada in 1886 and has 12 establishments in the archdiocese of Montreal; one in the archdiocese of Ottawa, one in the diocese of Saint Hyacinth, two in the diocese of Three Rivers and one in the diocese of Valleyfield. The object of the Order is the Christian education and instruction of youth. General motherhouse at Ploermel, France; Provincial House and Novitiate at Laprairie, near Montreal.

BROTHERS OF THE CHRISTIAN SCHOOLS, commonly called Christian Brothers. This is a society of men belonging to the Roman Catholic Church who devote themselves exclusively to the education of youth. The Society was founded in 1680 by Jean Baptiste de la Salle, canon of the metropolitan church of Rheims, who in the year 1900, was canonized by Pope Leo XIII.

The Society spread rapidly in France, partly because the Brothers made French the language of the schools instead of Latin, and partly because they did away with the individual system of teaching by grouping the pupils together into distinct classes. They abandoned the lecturing style in all their instructions for the Socratic method, introduced object-lessons and added museums to the equipment of the school.

These bold innovations in education met with popular favor and official recognition, and did more than anything else to bring about a general system of primary instruction in France.

In consequence of these reforms in the traditional methods of teaching, the Christian Brothers have come to be considered the founders of primary education in Europe. In due time, the Society spread to Italy, Belgium, Germany, Austria, England and Ireland; and also to Canada, the United States, South America, India and South Africa.

The general methods of teaching followed by the Brothers are explained in the 'Government of the Christian Schools,' while the qualities which they should possess as teachers are expounded in the 'Twelve Virtues of a Good Master.' Besides these two manuals, the Society has published for the benefit of its members numerous works on education and pedagogy, together with a series of textbooks on all subjects taught in the schools, including logic, ethics, literature, philosophy, methodology, mathematics, physics, etc.

The Christian Brothers established a college for the training of teachers in 1684, which was the first of its kind in Europe. They opened Sunday schools in 1699, also the first of their kind, in which secular as well as religious instruction was given in the afternoon. They have novitiates in every «province» of the Society for the religious formation, and scholasticates for the pedagogical training of their members. They direct schools of all grades from the primary to the college; they have agricultural and technical schools as well as normal colleges, orphanages and «protectories.» In the United States, they have colleges and other institutions taught by 1,021 Brothers and attended by over 29,900 pupils. Altogether, the Society has more than 1,600 schools, with 15,500 Brothers and 350,000 pupils.

The Society was suppressed in 1792 at the beginning of the French Revolution, was restored in 1803 by order of Napoleon I, and incorporated with the University of France in 1808. It was again officially suppressed in France in 1904 during the war against religious congregations waged by Premier Combes, but continued to live and flourish in other countries.

The Christian Brothers wear a distinctive religious habit and take the three vows of religion. As they do not take «orders,» they are free to devote themselves entirely to the work of education.

BROTHERS AND CLERKS OF THE COMMON LIFE, an institute founded by Gerhard Groot, a deacon of Deventer in 1384 for the purpose of providing a home for men who desired to live an austere Christian life without taking perpetual vows. See COMMON LIFE, BROTHERS OF THE.

BROTHERS OF OUR LADY OF LOURDES. This congregation was founded by Very Rev. S. M. Glorieux in 1830. Its object is the Christian education of youth, especially the poor, the care of orphan asylums and the nursing of the sick and old people in hospitals. Pope Leo XIII approved the congregation and its rule 18 July 1892. The Brothers conduct a house of studies and a boarding and day school at South Park, Wash., and a protectory for homeless boys at Pittsburgh and New Derry, Pa.

BROTHERS OF THE SACRED HEART, a Roman Catholic congregation established in Lyons, France, in 1820 by Père André Coindre, of the Society of Missionaries. In 1847 five Brothers came from France to this country to take charge of parish schools and asylums. They have establishments in the archdiocese of New Orleans, in the diocese of Alexandria, Brooklyn, Natchez, Mobile, Natchitoches Savannah, Trenton, Indianapolis, Manchester, Providence, Boston, Oklahoma and over 30 places in Canada. In September 1900 at a general Chapter of the Congregation held in France, two provinces were formed, one for the United States and the other for Canada. The object of the Brothers is the Christian education of youth in schools, asylums and colleges. A motherhouse was opened in Metuchen, N. J., June 1901. There are 225 Brothers, 5 colleges, 13 parochial schools, 1 house of studies, 1 novitiate and about 3,000 pupils in the United States.

BROUGH, brō, **John,** American statesman: b. Marietta, Ohio, 17 Sept. 1811; d. Cleveland, 29 Aug. 1865. In his youth he was a printer's apprentice. He studied at the Ohio University and later entered journalism. As a Democratic orator he became well known. In 1846 he entered the legal profession. In 1863 the Republican Union party nominated him for governor and he was elected by a joint vote of all electors advocating war. He has been called the «war governor» of his State.

BROUGHAM, brō-ăm, **Henry** (BARON BROUGHAM AND VAUX), British statesman and jurist: b. Edinburgh, 19 Sept. 1778; d. Cannes, 7 May 1868. His father, Henry Brougham, belonged to an old Westmoreland family, and his mother, Eleonora Syme, was a niece of Robertson the historian. He was educated at the High School and the University of Edinburgh, entering the latter at the age of 16. At the age of 18 he wrote an essay, 'Observations on the Phenomena of Light,' which, being sent to the Royal Society, was printed in its 'Transactions' for 1796. On leaving college he devoted himself to the study of law at Edinburgh, and was admitted a member of the faculty of advocates in 1800. As a member of the Speculative Society he was brought into contact with Jeffrey, Horner and others afterward famous; and along with the above-mentioned writers and Sydney Smith bore a chief part in the starting of the *Edinburgh Review* in 1802, to which he contributed a great number of articles. In 1803 appeared his 'Inquiry into the Colonial Policy of the European Powers,' a work which showed a wide extent of knowledge in the author, and drew upon him considerable attention. In it he expressed his decided hostility to the slave-trade. Finding too circumscribed a field for his abilities in Edinburgh, he removed to London, and in 1808 was called to the English bar. One of the first occasions on which he distinguished himself in his professional capacity was in 1810, when he spoke before the House of Lords in behalf of some Liverpool merchants who wished the repeal of the orders in council prohibiting trade with the states subject to France. The same year he entered Parliament as member for the rotten borough of Camelford, joined the Whig party, which was in opposition, and soon after obtained the passing of a measure making the slave-trade felony. He also succeeded, before the dissolution of Parliament, in getting the orders in council repealed. At the general election in 1812 he endeavored to get himself elected as one of the members for Liverpool, but was defeated by Canning, and remained without a seat till 1815, when he was returned for Winchelsea. He represented this borough up to 1830. On his return to Parliament he began his life-long efforts in the cause of education. In 1819 he and his friends established a model school for the children of the poorer classes in London. In 1825 he published his ‘Practical Observations upon the Education of the People,’ which ran through 20 editions. The same year he was elected lord rector of Glasgow University; and also introduced a bill into Parliament for the incorporation of the London University, of which he may be considered one of the chief founders. He also bore an active part in establishing the Society for the Diffusion of Useful Knowledge in 1827, the first publication of which was his ‘Discourse on the Objects, Pleasures and Advantages of Science.’ Meantime his reputation as a brilliant speaker and able advocate had been gradually increasing, and his fearless and successful defense of Queen Caroline in 1820–21 placed him on the pinnacle of popular favor. Two of the speeches spoken by him in this course are looked upon as classic specimens of English eloquence. But the part he took in the defense of the Queen brought him into disfavor with the King, and delayed his promotion for some years, so that it was not till 1827 that he was made a King's counsel. In Parliament he continued to speak against negro slavery, and in favor of what may be considered the most valuable of the reforms that we owe to him; namely, the amendment of the common law and of the judicial administration. On this subject he delivered a famous speech of six hours' duration, on 7 Feb. 1828. At the general election of 1830 he was returned for the large county of York, an honor which he attributed chiefly to a celebrated speech delivered by him shortly before on the slave-trade. In the ministry of Earl Grey he accepted the post of Lord Chancellor, and 22 Nov. 1830, was raised to the peerage, with the title of Baron Brougham and Vaux. The Reform Bill of 1832 received his warmest support in the House of Lords. In 1834, when the Whig ministry was dismissed, Lord Brougham of course lost the chancellorship, and this proved the end of his official life. He had proved a disagreeable colleague, and was heartily distrusted. Henceforth he devoted himself chiefly to legal and social reforms, maintaining his hostile attitude toward slavery, and continuing his labors in the cause of popular education. He was a zealous opponent of the corn laws. He latterly resided much at Cannes, in the south of France, which he «discovered» as a wintering resort. Lord Brougham accomplished a large amount of literary work, contributing to newspapers, reviews and encyclopædias, besides writing several independent works in his time. His works, collected by himself, were published in 10 volumes (Edinburgh 1855–57). He was president of University College, London, and chancellor of Edinburgh University.

Lord Brougham must be looked upon as one of the most remarkable men of his century. His energy and industry were amazing; and he had great powers of application; but he wrote on too many subjects to be an authority on any. It was said of him that if had known a little of law, he would have known a little of everything. Mathematics, history, biography, moral philosophy and physical science were among the subjects on which he wrote. His greatest service was undoubtedly in the improvement of the legal system. As an orator and parliamentary debater he was regarded as inferior to Canning alone. A little carriage specially built for him was nicknamed a «Brougham,» a name that has since been applied to this type of vehicle.

BROUGHAM, John, Irish actor and playwright: b. Dublin, 9 May 1810; d. New York, 7 June 1880. He was at first a student of surgery, but when thrown on his own resources he adopted the stage as a profession. After a short experience as actor, playwright and manager, he came to America in 1842. Eighteen years later he returned to England, but in 1865 he again came to the United States, and remained here till his death. He wrote about 100 plays, including ‘The Game of Love’; ‘Romance and Reality’; ‘Love's Livery’; ‘The Duke's Motto,’ etc., and contributed largely to periodicals.

BROUGHAM, a close four-wheeled carriage with a single inside seat for two persons, or a four-wheeled close carriage with two seats, accommodating four persons. Each type is glazed in front and has a raised seat for the driver. Named after Lord Brougham.

BROUGHTON, brow'ton, **Hugh**, English Biblical scholar: b. Owlbury, Shropshire, 1549; d. London, 4 Aug. 1612. He was educated at Cambridge, and early became distinguished for his familiarity with the learned tongues. He entered the Church, but his views coming under ecclesiastical disapproval, he went to the Continent for a time. For several years he preached to an English congregation in one of the cities of Holland. His disappointment in receiving no part in the King James version led him to criticize the version unsparingly. He wrote ‘A Concert of Scripture’; and an ‘Explication of the Article of Christ's Descent into Hell.’ Ben Jonson in two of his plays holds up to ridicule this Puritan preacher. Consult ‘Ed. of his Life and Literary Remains’ by John Lightfoot (London 1662).

BROUGHTON, Lord (JOHN CAM HOBHOUSE), Baron, English statesman and writer: b. near Bristol, 27 June 1786; d. London, 3 June 1869. He was educated at Westminster School and Trinity College, Cambridge, whence he was graduated B.A. in 1808, and M.A. in 1811. He was an intimate friend of Lord Byron, and accompanied him in his travels to Spain, Portugal, Greece and Turkey in 1809. In 1812 appeared his ‘Journey Through Albania and Other Provinces of Turkey.’ In the years 1813 and 1814 he accompanied the allied armies in Germany, and was present at the battle of Dresden. He also accompanied Byron to Italy in 1816–17, and visited Rome and Venice with him. He suggested an extension of the 4th canto of ‘Childe Harold,’ which Byron dedicated to him, and by arrangement with the poet he undertook to write for it a series of notes, for which his observations during their journey furnished materials. These notes were written at Venice, and ultimately formed a separate work, 'Historical Illustrations of the Fourth Canto of Childe Harold,' published by Murray in 1818. Hobhouse was an advanced Liberal in politics, and on his return took an active part in the advocacy of reforms. In 1816 he published anonymously the 'Hundred Days in Paris,' which, from its hostility to the Bourbon cause, gave great offense to the governments of France and England, while a French translator and the publisher of it were fined and imprisoned for issuing an anonymous pamphlet, the 'Trifling Mistake.' Broughton was committed to Newgate, and kept there for almost three months. In 1820 he was elected to Parliament representing the borough of Westminster, and became a supporter of Liberal measures, as the Reform Bill of 1832, the repeal of the Test and Corporation acts, the removal of Catholic disabilities, etc. In February 1832, he entered Lord Melbourne's Ministry as Secretary of War, and became a privy councillor. In 1833 he was made Chief Secretary for Ireland, but lost his seat in seeking re-election. In 1834, he was made Chief Commissioner for Woods and Forests, and the following year became president of the Board of Control. He lost his seat for Nottingham in 1847, but a seat was found for him at Harwich, which he continued to occupy till he was raised to the peerage in 1851. He had succeeded his father as baronet in 1831. As he left no male issue the title became extinct, the baronetcy passing to his nephew. He published 'Imitations and Translations from the Classics' (1809); 'Journey through Albania and Other Provinces of Turkey' (1812). His diary, which he desired to be left unopened until 1900, is in the British Museum. Consult Lady Dorchester (ed.), 'Recollections of a Long Life' (London 1909).

BROUGHTON, Rhoda, English novelist: b. North Wales, 29 Nov. 1840; d. London, Eng., 5 June 1920. Her novels, especially the earlier ones, show great cleverness, and are very popular. They include 'Cometh Up as a Flower' (1867); 'Not Wisely but Too Well' (1867); 'Red as a Rose Is She' (1870); 'Goodbye, Sweetheart, Goodbye' (1872); 'Nancy' (1873); 'Belinda' (1883); 'Doctor Cupid' (1886); 'Alas!' (1890); 'A Beginner' (1894); 'Scylla or Charybdis?' (1895); 'The Game and the Candle' (1899); 'Lavinia' (1902); 'The Devil and the Deep Sea' (1910); 'Between Two Stools' (1912).

BROUSSA, brö'sa. See BRUSSA.

BROUSSAIS, broo'sās', **François Joseph Victor,** French physician: b. Saint Malo, 17 Dec. 1772; d. 17 Nov. 1838. Educated at the College of Dinan, he entered the army and soon attained the rank of sergeant; but a severe illness caused him to give up a military career and devote himself to medicine. He studied under his father, and returned to the service with a surgeon's commission, being attached first to the army and then to the navy. In 1799 he studied at Brest and Paris and from 1804–08 was again surgeon in the army; from 1808–14 was chief physician of a division of the French army in Spain, and in 1820 obtained a professorship at Val-de-Grâce, a chair which he exchanged in 1831 for that of general pathology in the faculty of medicine at Paris. In 1841, a statue was erected to his memory at Val-de-Grâce. His first important work was his 'Recherches sur la Fièvre Hectique' (1803), which was followed by the more celebrated 'Histoire des Phlegmasies ou inflammations chroniques' (1808), and 'Examen de la doctrine médicale généralement adoptée' (1816). In these works he propounded what is known as the physiological system of medicine. According to him irritation or excitation is the fundamental property of all living animal tissues, and diseases are produced by an undue increase or diminution of that property. Broussais also taught and wrote on phrenology. Besides the works already mentioned, Broussais wrote 'Traité de la physiologie appliquée à la pathologie' (1824); 'Commentaires des propositions de pathologie consignées dans l'examen' (1829); 'Le choléra morbus épidemique' (1832). Consult Montègre, 'Notice historique sur la vie, les travaux et les opinions de Broussais' (Paris 1839); and Reis, 'Etude sur Broussais et sur son œuvre' (Paris 1869).

BROUSSON, Claude, French martyr: b. Nîmes 1647; d. Montpellier, 4 Nov. 1698. He was educated for the law, and practised as an advocate first at Castres and Castelnaudary, and afterward in the Parliament of Toulouse, where the Protestants, to whom he belonged, were often indebted to him for the zeal and ability with which he defended their cause. In 1683, when the government had resolved on recalling the edict of Nantes, and trying the effect of persecution as a means of suppressing the Reformation, it was at Brousson's house the deputies from all the churches assembled, and resolved that, even were their churches destroyed, they would still hold their meetings, though it should be under the canopy of heaven. His part in this and other important movements marked him out as one of the first objects of attack; and on receiving warning of an intention to arrest him, he sought an asylum at Lausanne, where he published several works, exposing the persecutions to which the Protestants of France were subjected, and awakening the sympathy of their brethren in all other parts of Europe. Nor was he satisfied merely to aid the cause with his pen. At the hazard of his life he returned to France, and continued for four years among the recesses of the Cevennes, preaching the gospel. In 1693 he repaired to Holland, where a pension was given him by the States-General; but the sufferings of his persecuted countrymen were ever uppermost in his mind, and he visited many courts of Europe to plead their cause, and more than once went to France for their instruction and encouragement. He was on a mission to France when, a price having been set on his head, he was arrested at Oléron, tried at Montpellier, condemned to be broken on the wheel and executed accordingly. He left a large number of works including 'L'Etat des reformes de France' (3 vols., 1685); 'Lettres pastorales' (1697); 'Lettres et opuscules' (1701). Consult Payne, 'The Evangelist of the Desert' (1853).

BROUSSONET, broo-son-ā', **Pierre Marie Auguste,** French naturalist: b. Montpellier, 28 Feb. 1761; d. there, 27 July 1807. In Paris he studied natural history; went to England and pursued ichthyology, and after three years' residence there returned and was assistant in the College of France. At this period he communicated a number of valuable papers to the Academy of Sciences, of which he became a member. In 1785 he was appointed secretary to the Paris Agricultural Society. Merino sheep and the Angora goat are said to have been first introduced by him into France. The Revolution breaking out, he became connected with the Girondists. On the downfall of that party he was arrested at Montpellier, but having escaped, crossed the Pyrennes under the pretext of botanizing, and arrived in Spain destitute. Later he went to Africa and resumed his botanical studies, making some important collections. Returning to France, after executing various missions he was appointed, in 1805, to the chair of botany at Montpellier. In the same year he became a member of the Corps Législatif. He died from the effects of a fall by which the brain had been seriously injured. Besides his ‘Ichthyologiæ Decas Prima’ (1872), his publications include important memoirs of ichthyology and botany.

BROUSSONETIA, a genus of trees. See Mulberry.

BROUWER, or **BRAUWER, Adrian.** See Brauwer, Adrian.

BROWER, Jacob Vradenburg, American explorer and archæologist: b. York, Mich., 21 Jan. 1844; d. 1905. He served in the cavalry and the navy during the Civil War, was a member of the Minnesota legislature, 1867–73, and discovered numerous prehistoric mounds at Mille Lac and other points in Minnesota. He published ‘The Mississippi River and Its Source’ (1893); ‘Prehistoric Man at the Head Waters of the Mississippi’ (1895); ‘The Missouri River and Its Utmost Source’ (1896); ‘Quivira’ (1898); ‘Harahey’ (1899); ‘Mille Lac’ (1899).

BROWN, Aaron Venable, American politician: b. Brunswick County, Va., 15 Aug. 1795; d. 1859. He studied law, and commenced practice in Nashville, Tenn. He was partner in business with President Polk, until the latter entered upon his congressional career; served in almost all the sessions of the legislature of Tennessee between 1821 and 1832; was a member of the House of Representatives in Congress from 1839 to 1845; and was in that year elected governor of Tennessee. He was a delegate to the Southern convention held at Nashville in 1850, and submitted a report to that body known as the Tennessee platform. He was also a member of the convention of the Democratic party at Baltimore in 1852, to which he reported the platform adopted by them. In 1857 he became a member of President Buchanan's Cabinet, in which he held the office of Postmaster-General. His speeches were published in Nashville (1854).

BROWN, Abbie Farwell, American writer for young people: b. Boston, about 1875. She was educated at the Boston Girls' Latin School and at Radcliffe College; was one of the editors of the ‘Young Folks Library’ (1902); traveled abroad in 1899, 1906 and 1910. She has published ‘The Book of Saints and Friendly Beasts’ (1900); ‘The Lonesomest Doll’ (1901); ‘A Pocketful of Posies’ (verse, 1902); ‘In the Days of Giants’ (1902); ‘The Flower Princess’ (1903); ‘The Star Jewels’ (1904); ‘Brothers and Sisters’ (1905); ‘Friends and Cousins’ (1906); ‘The Story of Saint Christopher’ (1906); ‘The Curious Book of Birds’ (1907); ‘Fresh Posies’ (verse, 1908); ‘John of the Woods’ (1909); ‘Tales of the Red Children’ (1909); ‘The Christmas Angel’ (1910); ‘Their City Christmas’ (1912); ‘The Lucky Stone’ (1913); ‘Song of Sixpence’ (verse, 1914); ‘Kissington Town’ (1915); is also the author of several plays and librettos, of many song-texts and magazine tales.

BROWN, Addison, American lawyer, judge and botanist: b. West Newbury, Mass., 21 Feb. 1830. A graduate of Harvard College and Law School in 1854, he was associated with the New York bar from 1855 to 1881, and until 1901, when he resigned, was judge of the District Court of the United States for the southern district of New York. Dealing with shipping, admiralty, extradition and bankruptcy nearly 2,000 of his decisions are found in *The Federal Reporter,* Vols. VIII to CXV. As a botanist, Judge Brown is also well known. He was one of the founders (1891) of the New York Botanical Gardens and is the author of ‘Illustrated Flora of the Northern United States and Canada’ (3 vols., 1896–98; new edition, with Nathaniel L. Britton, 1913); ‘The Elgin Botanical Garden and its Relation to Columbia College and the New Hampshire Grants’ (1908).

BROWN, Albert Gallatin, American statesman: b. Chester District, S. C., 31 May 1813; d. near Jacksonville, Miss., 12 June 1880. His parents removed to Mississippi while he was a child. He took a boyish interest in military affairs, and was made a brigadier-general in the State militia when only 19 years of age. He adopted the law as a profession, gaining admission to the bar in 1834, and was a member of the State legislature from 1835 until 1839, and member of Congress from Mississippi in 1840–41. He was also a judge of the Circuit Superior Court in 1841–43; governor of Mississippi on successive re-elections from 1843 to 1848; again member of Congress from 1848 to 1854; and United States senator from 1854 until 1858. He was re-elected for six years, beginning 4 March 1859, but resigned in 1861 to join in the rebellion. His colleague in the Senate at the time was Jefferson Davis, and they both attended the caucus of seceding senators, held in Washington, 6 Jan. 1861. He was an uncompromising adherent of the Democratic party in the South. A volume of his speeches was published in 1859.

BROWN, Alexander, American historian: b. Glenmore, Nelson County, Va., 5 Sept. 1843; d. 29 Aug. 1906. He studied for a short time at Lynchburg College. He served in the Confederate army during the Civil War and from 1880 devoted himself to literature. His point of view on the history of Virginia was that the commonly accepted historical account, based on works and documents of the court party, is largely inaccurate and unjust to the original founders. He wrote ‘New Views of Early Virginia History’ (1886); ‘The Genesis of the United States’ (1890); ‘The Cabells and Their Kin’ (1895); ‘The First Republic in America’ (1898); ‘The History of Our Earliest History’ (1898); ‘English Politics in Early Virginia’ (1901); besides numerous articles for historical societies and magazines.

BROWN, Alice, American novelist and writer of short stories descriptive of phases of New England life: b. Hampton Falls, N. H., 5 Dec. 1857. She was graduated at Robinson Seminary, Exeter, N. H., 1876; taught school for several years, but has given herself entirely to literary pursuits for some years. Her work is most careful and conscientious in character, displaying equal literary skill and sympathetic insight into character. She has published 'Fools of Nature' (1895); 'Meadow Grass' (1895); 'By Oak and Thorn,' a volume of English travels (1896); 'The Road to Castaly,' a book of verse (1896); 'The Day of His Youth' (1896); 'Tiverton Tales' (1899); 'King's End' (1901); 'Margaret Warrener' (1901); 'Life of Mercy Otis Warren'; 'The Mannerings'; 'High Noon'; 'Paradise'; 'The County Road' (1906); 'The Court of Love' (1906); 'Rose MacLeod' (1908); 'The Story of Thyrza' (1909); 'Country Neighbors,' stories (1910); 'John Winterbourne's Family' (1910); 'The One-Footed Fairy' (1911); 'The Secret of the Clan' (1912); 'Vanishing Points' (1913); 'Robin Hood's Barn' (1913); 'My Love and I' (1913); 'Children of Earth,' Winthrop Ames' Prize Play (1915). See CHILDREN OF EARTH.

BROWN, Arthur Judson, American Presbyterian clergyman and author: b. Holliston, Mass., 3 Dec. 1856. A graduate of Wabash College and of Lane Theological Seminary he was ordained in 1883 and held pastorates in Ripon, Wis., Oak Park, Ill., and Portland, Ore. Appointed one of the secretaries of the Presbyterian Board of Foreign Missions, he made world tours of inspection in 1901–02 and in 1909. He is the author of 'The New Era in the Philippines' (1903); 'New Forces in Old China' (1904); 'The Foreign Missionary' (1907); 'The Nearer and Farther East' (1908); 'The How and Why of Foreign Missions' (1909); 'The Chinese Revolution' (1912); 'Unity and Missions — Can a Divided Church Save the World?' (1915); 'Rising Churches in Non-Christian Lands' (1915).

BROWN, Benjamin Gratz, American politician: b. Lexington, Ky., 28 May 1826; d. Saint Louis, 13 Dec. 1885. He was graduated at Yale (1847) and practised law in Missouri and was a member of the State legislature in 1852–58. In 1854 he began the *Missouri Democrat.* In the Civil War he served in the Union army, recruiting a regiment, and becoming a brigadier-general of volunteers. In 1863–67 he was United States senator from Missouri, and in 1871 was elected governor of his State. He was the candidate for the Vice-Presidency of the United States on the ticket with Horace Greeley in 1872.

BROWN, Charles Brockden, American novelist: b. Philadelphia, 17 Jan. 1771; d. 22 Feb. 1810. He descended from a family of Quakers, was remarkable in his childhood for his attachment to books, and at the age of 16, after having received a liberal education at the school of Robert Proud, an historian and noted teacher, had already formed plans of extensive literary works. The delicacy of his constitution incapacitated him for the bustle of business and all athletic amusements. During frequent visits to New York he became intimate with a literary club, which fostered his devotion to letters, drew him away from his Quaker modes of life and thought and increased his eagerness to be conspicuous as a writer. He kept minute journals, indited essays and dissertations and cultivated, with unremitting assiduity, the arts of composition. He moved to New York and in 1797 published 'Alcuyn: A Dialogue on the Rights of Women.' The first novel which he wrote was entitled 'Sky Walk,' subsequently incorporated in 'Edgar Huntley.' 'Wieland,' his first published novel, appeared in 1798. It soon acquired the reputation of a powerful and original romance. The next was 'Ormond, or the Secret Witness' (1799), which had neither the success nor the merit of the other, but still exhibits uncommon powers of invention and description. At this time Brown had begun no less than five novels, two of which — 'Arthur Mervyn' and 'Edgar Huntley,'— were completed and sent forth almost immediately. In the former the ravages of the yellow fever, which the author had witnessed in New York and Philadelphia, are painted with terrific realism. All these works abound in both excellencies and faults and are strikingly original. In 1801 he published another novel,— 'Clara Howard,'— less open to exception, but also less deserving of praise. Its form is different from that of the others, being epistolary. The last of his novels was 'Jane Talbot' (1804). It is deficient in interest, and indeed in all respects inferior to its predecessors. In April 1799, Brown published the first number of the *Monthly Magazine and American Review.* This work he continued until the end of the year 1800, writing abundantly for it. Circumstances compelled him to relinquish it; but in 1805 he commenced another journal, with the title of the *Literary Magazine and American Register,* and in this undertaking persevered for five years. In 1806 he entered upon a new work, a semi-annual *American Register,* five volumes of which he lived to complete and publish. It is now and must long be consulted as a valuable body of annals. In 1809 it was discovered that his lungs were seriously affected, and he then consented to travel for the recovery of his health. The remedy, however, was applied too late. In November of that year he betook himself to his chamber, as he thought, for a few days; but his confinement lasted until February and ended only with his life. His writings are characterized by rich diction, variety of incident and vivid representation, but he deals too much in the extravagant and the horrible. He has been praised highly, but his reputation did not live long. He should be remembered as the first truly professional man of letters in America. His novels were collected in seven volumes (1827) with a 'Life' by Dunlap, re-edited in Philadelphia (1857); and again enlarged with a critical comment by McKay. Consult Prescott, 'Biographical and Critical Miscellanies' (Philadelphia 1867); Wendell in 'A Literary History of America' (New York 1900); Marble, A. R., 'Heralds of Literature' (Chicago 1907); Erskine, 'Leading American Novelists' (New York 1909).

BROWN, Charles Reynolds, American Congregational clergyman, lecturer and author: b. Bethany, W. Va., 1 Oct. 1862. A graduate in

1883 of the University of Iowa, he studied theology at Boston University, lectured at different times at Columbia, Yale, Cornell and Leland Stanford universities, and was pastor of the First Congregational Church at Oakland, Cal., from 1896 to 1911, when he became dean of the Yale Divinity School. He traveled through Egypt and Palestine for professional study in 1897, and was lecturer at Leland Stanford Jr. University, 1899–1906; Yale, 1905–06; Cornell, 1909; Columbia, 1911. He is the author of 'Two Parables' (1898); 'The Main Points' (1899); 'The Social Message of the Modern Pulpit' (1906); 'The Strange Ways of God, a Study of the Book of Job' (1908); 'The Cap and Gown' (1910); 'The Modern Man's Religion' (1911); 'The Quest of Life and Other Addresses' (1913).

BROWN, Charles Rufus, American Baptist clergyman and Hebrew scholar: b. Kingston, N. H., 22 Feb. 1849; d. 2 Feb. 1914. A graduate of the United States Naval Academy, he resigned from the service in 1875 to study at Harvard, Newton Theological Institution, Union Theological Seminary and the universities of Berlin and Leipzig. He became associate professor of Biblical interpretation in 1883 and professor of Hebrew and related languages in 1886 in Newton Theological Institution. He was resident director of the American School of Oriental Research in Jerusalem 1910–11. His published works include 'An Aramaic Method' (1884, 2d ed., 1893); a translation of 'Jeremiah' (1906), and 'A Commentary on Jeremiah' (1907).

BROWN, David, Scotch ecclesiastical writer: b. Aberdeen, 17 Aug. 1803; d. Aberdeen, 3 July 1897. He was educated at the University of Aberdeen, from which he was graduated in arts and theology. He was assistant to Edward Irving in London (1830–32). He finally went over to the Free Church in 1843 and at once became minister of Saint James, Glasgow, where 14 years later he became professor of apologetics, Church history and exegesis of the Gospels at the Free Church College, of which he became principal in 1876. He was director of the National Bible Society of Scotland and one of the founders of the Evangelical Alliance and moderator of the General Assembly of the Free Church (1885).. Among his published works are 'Christ's Second Coming' (1846); 'Crushed Hopes Crowned in Death' (1861); 'The Restoration of the Jews' (1861); 'Life of John Duncan' (1872); 'The Apocalypse' (1891). R. Jamieson and A. R. Fausset and he collaborated in making the 'Commentary, Critical, Experimental and Practical on the Old and New Testaments' (6 vols., Glasgow 1864–70), of which he personally wrote the part devoted to the Gospels, the Acts and the Epistle to the Romans. He also did much other work of a like nature.

BROWN, David, Cherokee preacher: b. about 1800; d. Creek Path, Miss., 14 Sept. 1829. He was educated with his sister Catherine at the school of Rev. Cyrus Kingsbury, in what was then the Cherokee territory, in northern Alabama and Mississippi, and engaged with her in educating and christianizing their native tribe. He was a preacher and interpreter, and also acted as secretary of the Indian government. In November 1819 he assisted John Arch in the preparation of a Cherokee spelling-book, which was printed. Through his agency a mission was established at Creek Path town in 1820. David Brown united with the Church at this time, and in the spring of the same year went to Cornwall, Conn., to attend school. After two years there he spent a year at Andover, fitting himself for the ministry. Returning to his birthplace, he began his missionary work and made many converts to Christianity among the Cherokees. According to a letter written by him in 1825, the Christian religion was generally adopted by the tribe and an advanced standard of civilization had been attained by them. He died before the Cherokees were dispossessed by the United States in defiance of treaty obligations.

BROWN, Elmer Ellsworth, American educator: b. Kiantone, Chautauqua County, N. Y., 28 Aug. 1861. He was graduated at the Illinois State Normal University 1881, and at the University of Michigan, A.B., 1889, and made use of the intervening time in earning the means for his university course by teaching public schools in Belvidere, Ill. He was elected association State secretary for Illinois of the Y. M. C. A. and served in that capacity, 1884–87; was principal of the high school, Jackson, Mich., 1890–91; acting assistant professor of science and art of teaching at Ann Arbor, 1891–92; associate professor of a similar chair in the University of California, 1892–93; full professor, 1893–1906, and honorary professor from 1 July 1906, when he was appointed United States Commissioner of Education to succeed William T. Harris, deceased, and thus became head of the Bureau of Education in the Department of the Interior, Washington, D. C. Became chancellor of New York University in 1911. He visited Europe (1889) to pursue a post-graduate course in pedagogy at the University of Halle, Wittenberg, Germany, receiving the degree of Ph.D. in 1890. His honorary degrees are Columbia, LL.D. (1907) and Wesleyan, LL.D. (1909). He was elected member of the National Council of Education and served as president, 1905–07. He was also made fellow of the American Academy of Arts and Science and vice-president of the section of education in 1907. Among his contributions to pedagogic literature are 'The Making of our Middle Schools' (1903); 'Origin of American State Universities' (1905); 'Government by Influence and other Addresses' (1909); 'An Efficient Organization and Enlarged Scope for the Bureau of Education' (1910). He has also published in pamphlet form many articles written for magazines.

BROWN, Ernest William, American mathematician and astronomer: b. Hull, England, 29 Nov. 1866. He took his degrees at Christ College, Cambridge; was appointed professor of mathematics at Haverford College, 1891, and at Yale University in 1907. He was for some time editor of *The Transactions of the American Mathematical Society* and of the *Bulletin of the American Mathematical Society* and besides numerous pamphlets of scientific value has published 'Treatise on the Lunar Theory' (1896); 'A New Theory of the Moon's Motion' (1897–1905); and the Adams prize essay for 1907 in the University of Cambridge, ‹The Inequalities in the Motion of the Moon due to the Direct Action of the Planets› (1908).

BROWN, Ford Madox, English painter, grandson of Dr. John Brown of Edinburgh, author of the Brunonian system of medicine: b. Calais, France, 16 April 1821; d. London, 6 Oct. 1893. He studied at Bruges, Ghent and Antwerp, and after a three years' residence in Paris he went to England about 1845. His Wiclif and Chaucer pictures, in the manner of Peter Cornelius and the German Pre-Raphaelites, were painted shortly afterward. One of these, ‹Wiclif Reading his Translation of the Bible› (1848), aroused Rossetti's admiration and caused his enrolment among Brown's pupils. In 1844 and 1845 he contributed (unsuccessfully) cartoons of the ‹Finding of the Body of Harold,› ‹Justice› and other subjects to the competitive exhibition for the frescoes of the Houses of Parliament. In 1865 he opened in London an exhibition of many of his pictures, including ‹The Last of England› (1852); ‹The Autumn Afternoon›, and ‹Work› (1865), the last named having occupied him for several years. Only a month before his death he completed the last of the 12 Manchester town-hall frescoes, on which he had been engaged for a long time. Among his other works are ‹Lear and Cordelia› (1849); ‹Pretty Baa-Lambs› (1851); ‹Chaucer at the Court of Edward III› (1851), and ‹Cordelia's Portion.› He is generally rated as a Pre-Raphaelite, but though a close intimacy existed between him and the brotherhood, he never actually joined them. Consult Hueffer, ‹Ford Madox Brown: a Record of His Life and Work› (London 1896); Stephens in ‹The Portfolio› (London 1893).

BROWN, Francis, American scholar: b. Hanover, N. H., 26 Dec. 1849; d. 15 Oct. 1916; graduated, Dartmouth College 1870, and Union Theological Seminary, New York, in 1877. He was instructor in Biblical philology in the latter institution 1879–81; associate professor 1881–90; professor of Hebrew from 1890; and on 12 May 1908 was elected president. He is the author of ‹Assyriology: Its Use and Abuse in Old Testament Study› (1885); ‹The Teaching of the Twelve Apostles› with Hitchcock (1884); ‹Hebrew and English Lexicon of the Old Testament› with Driver and Briggs (1891–1906); ‹The Christian Point of View› with Knox and McGiffert (1902). He contributed to many leading periodicals and reviews.

BROWN, George, Canadian statesman: b. Alloa, Scotland, 29 Nov. 1818: d. 10 May 1880; educated Royal High School and Southern Academy, Edinburgh. He emigrated to the United States with his father in 1838 and assisted in the management of a newspaper in New York; but in 1843 removed to Toronto, where he founded *The Globe,* a newspaper which soon became a power in upper Canada. In 1852 he was returned to Parliament and rapidly rose to the first rank as a debater and advocate of reforms. In 1858 he was called to the office of Premier and formed an administration which, however, owing to an adverse vote of the Assembly, lasted only three days. In 1864 he joined the coalition government as leader of the reform section and took an active part in the Confederation conferences at Charlottetown and Quebec, but resigned his office as minister in December 1865. He was called to the Senate in 1873, and the year after was sent to Washington as Commercial Ambassador and succeeded in negotiating the Brown-Fish draft treaty, which, however, failed to secure ratification from the American Senate. He was one of the first to foresee the future development of the Canadian Northwest, and strongly advocated the incorporation of the Hudson Bay Company's territories within the Dominion. He was a courageous advocate of better relations with the United States. His personal magnetism was remarkable, but he lacked the spirit of compromise. He died of a gunshot wound inflicted by a discharged employee. Consult Mackenzie, ‹Life and Speeches of the Hon. George Brown› (1882), and Lewis's ‹George Brown› (1910).

BROWN, George, American rear-admiral: b. Indiana, 19 June 1835; d. 29 June 1913. He entered the navy in 1849 and served with distinction in the Federal navy during the Civil War, especially distinguishing himself on the night of 24 Feb. 1863, when, in command of the *Indianola* at Palmyra Island, he defended himself for an hour and a half against four Confederate gunboats. Finally he was wounded and taken prisoner and his vessel was destroyed. He became a commander in 1866 and a rear-admiral in 1893. He commanded the naval forces in the Philippines in 1889, and the Norfolk Navy Yard in 1890, and again in 1893–97. He retired in the latter year.

BROWN, George Loring, American landscape artist: b. Boston, 2 Feb. 1814; d. 25 June 1889. At first he studied wood engraving under Alonzo Hartwell and worked as an illustrator. He went abroad at 16 and on his return, two years later, was a pupil of Washington Allston. In 1840 he went to Paris to study under Isabey. Among noted pictures by him are ‹Doge's Palace and Grand Canal›; ‹Bay of Naples›; ‹Moonlight Scene›; ‹The Crown of New England›; and The Bay of New York,› the two latter acquired by Edward VII when visiting the United States as Prince of Wales. The composition is good, the coloring harmonious, but they are spoiled by being too theatrical.

BROWN, George William, American jurist: b. Baltimore, Md., 1812; d. 1890. After studying law at Rutgers College, New Jersey, he was admitted to the bar and in 1860 was elected mayor of his native city. At the time of the passage of troops through Baltimore, 19 April 1861, he placed himself at the head of the 6th Massachusetts regiment, then on its way to Washington, and did everything in his power to suppress the riot which the appearance of the soldiers had occasioned. He was chief justice of the Maryland Supreme Court, 1873–88; professor of international and constitutional law in the University of Maryland, and with two others compiled the first ‹Digest of the Decisions of the Maryland Court of Appeals› (1847). He published numerous other addresses.

BROWN, Helen Dawes, American writer and lecturer: b. Concord, Mass., 15 May 1857. She was graduated at Vassar College, 1878, and received the degree of A.M. from the same college in 1890. She has published ‹Two College Girls' (1886); 'The Petrie Estate' (1893); 'Little Miss Phœbe Gay' (1895); 'A Civilian Attaché' (1899); 'Her Sixteenth Year' (1901); 'A Book of Little Boys' (1904); 'Mr. Tuckerman's Nieces' (1907); 'Orphans' (1911); 'How Phœbe Found Herself (1912); 'Talks to Freshman Girls' (1914).

BROWN, Henry Kirke, American sculptor: b. Leyden, Mass., 24 Feb. 1814; d. Newburg, N. Y., 10 July 1886. He began to paint portraits while quite a boy, studied painting under Chester Harding, and in 1836–39 spent his summers as a railroad engineer in order to make possible his future studies. He spent four years in Italy. He made the equestrian statue of Washington in Union square, New York, the altar piece for the church of the Annunciation in the same city; portrait busts of William Cullen Bryant, Dr. Willard Parker, Erastus Corning and other New York men, and the statue of De Witt Clinton in Greenwood cemetery. The last named was the first bronze statue cast in the United States. Mr. Brown brought skilled workmen from Europe and did the first work in bronze casting attempted in this country. Some of his other well-known works are a statue of Lincoln in Prospect Park, Brooklyn, and equestrian statues of General Scott and Nathanael Greene for the national government.

BROWN, Jacob, American general: b. Bucks County, Pa., 9 May 1775; d. Washington, 24 Feb. 1828. He was descended from members of the Society of Friends; supported himself in early life by teaching school; was also employed for some time as a surveyor of public lands in Ohio; and settling in Jefferson County, N. Y., in 1799, became one of the pioneers in that part of the country and founded the village of Brownsville. He next joined the militia service as a militia general in 1812; was soon after appointed brigadier-general in the regular army, and in 1814 major-general; assisted in the defense of Sackett's Harbor in 1813; exhibited much bravery in the battle of Chippewa, in that of Niagara Falls and at the siege of Fort Erie; received the thanks of Congress and a gold medal, «emblematical of his triumphs»; and finally, at the termination of the war, continued in the army as major-general, and in 1821 succeeded to the supreme command.

BROWN, John, Scottish covenanter and martyr: b. about 1627; d. 1685. He is said to have fought against the government at Bothwell Bridge in 1679, and to have been on intimate terms with the leaders of the persecuted party. He was shot by Claverhouse and a party of his dragoons, for refusing to acknowledge the King, at Priestfield, or Priesthill, in the upland parish of Buirkirk, Ayrshire, where he cultivated a small piece of ground and acted as a carrier. Consult Woodrow, 'History of the Sufferings of the Church of Scotland' (Edinburgh 1721–22); Napier, 'Life and Times of John Graham' (ib. 1862), containing Claverhouse's report of the killing. A life of Brown was published at Stirling in 1828.

BROWN, John, Scottish Biblical scholar: b. Carpow, Perthshire, 1722; d. 19 June 1787. Successively herd-boy, peddler, soldier and schoolmaster, by his intense application to study he became acquainted with the French, Italian, German, Arabic, Persian, Syriac and Ethiopic languages, as well as the Greek and Hebrew. He became pastor at Haddington, Scotland, in 1751, and remained in that position till his death, though called to a pastorate in the Dutch Reformed Church in New York in 1784. In general he preached three sermons every Sabbath day. He was appointed professor of theology to the Associate Synod in 1768. His most important works are 'Dictionary of the Bible' (1769) and 'Self-Interpreting Bible' (1778), so called from the copious marginal references to other passages of Scripture by which it is distinguished. These have gone through many editions.

BROWN, John, Scottish physician, author of the Brunonian system in medicine: b. Buncle, Berwickshire, 1735; d. London, 17 Oct. 1788. His parents were in a very humble sphere in life, his father being merely a day laborer. Like the children of other Scottish cottars, however, he had the advantage of being educated at the parish school, where he was very soon distinguished for his abilities and the rapid progress he made in his studies. His father having died, his mother married a weaver, and young Brown was bound an apprentice to that business, but the distaste he evinced for it was so great as to induce his stepfather to cancel his indentures and remove him to the grammar school of Dunse, where he was looked upon as a prodigy — reading all the Latin authors with the greatest facility, and soon making considerable progress in Greek. In 1755 he went to Edinburgh, with the intention of studying divinity and entering the Church, but soon abandoned his theological studies. Having been employed by a medical student to translate his thesis into Latin, he succeeded so well that the elegance and purity of the language attracted the notice and encomiums of the professors and led to his commencing the study of medicine. In the year 1765 he married, and opened a boarding-house for the accommodation of medical students; but being irregular and intemperate in his habits was soon reduced to bankruptcy. Having taken the degree of doctor in medicine at Saint Andrew's, he commenced practice in Edinburgh, and produced his celebrated work, entitled the 'Elements of Medicine.' He then commenced lecturing on the practice of physic, and made use of this work as his textbook. He divided all diseases into two classes, those resulting from a deficiency, and those resulting from an excess of excitement; the one class to be treated with stimulants, the other with debilitating medicines. Becoming involved in pecuniary embarrassments, he removed to London in 1786. The system of physic which he taught, though no longer accepted as a system, had a distinct influence on subsequent practice.

BROWN, John, American merchant: b. Providence, R. I., 27 Jan. 1736; d. there, 20 Sept. 1803. A man of energy and enterprise, he developed the industry and extended the trade of his native city in a notable degree, being, it is said, the first merchant in Rhode Island to carry trade to China and the East Indies. Though having large interests at stake in the existing order of things, he was a leader in the cause of the American Revolution, and headed the party which destroyed the *Gaspée* in Narragansett Bay, 17 June 1772. He was chosen a delegate to the Continental Congress in 1784, but did not take his seat in the body. When Rhode Island refused to adopt the national Constitution, he did more than any other man toward securing the final reversal of that opposition. From 1799 to 1802 he was a representative in Congress. He at all times fostered the interests of the Baptist Church, contributed largely to the endowment of the present Brown University, laid the cornerstone of its original hall and was its treasurer from 1775 to 1796.

BROWN, John, American soldier: b. Sandisfield, Mass., 19 Oct. 1744; d. Stone Arabia, N. Y., 19 Oct. 1780. He was graduated at Yale 1771, studied law in Providence, R. I., and in 1773 settled in Pittsfield, Mass., where he identified himself actively with the patriot cause. In 1775 he was a delegate to the Provincial Congress, and was with Ethan Allen at the capture of Ticonderoga. In the same year he assisted in the capture of Fort Chambly, planned the attack on Montreal which resulted disastrously, and was at the storming of Quebec. Congress commissioned him a lieutenant-colonel in 1776, and in 1777 he conducted an expedition against Ticonderoga and the posts in its vicinity, releasing 100 American prisoners and capturing large quantities of stores and provisions. Soon after this he retired from the service on account of his detestation of Arnold. At Albany in the winter of 1776–77 he published a handbill denouncing Arnold, predicting that he would become a traitor, and closing with the remarkably prophetic words, «Money is this man's God, and to get enough of it he would sacrifice his country.» Brown was afterward employed in the Massachusetts service, and in the autumn of 1780, with the Berkshire militia, marched up the Mohawk Valley for the relief of Schuyler and to act as circumstances might require. He was killed in ambush with 45 of his men at Stone Arabia, in Palatine, on his birthday.

BROWN, John, Scottish clergyman: b. Whitburn, Linlithgowshire, 12 July 1784; d. Edinburgh, 13 Oct. 1858. He was ordained pastor of the burgher congregation at Biggar in 1806. In 1821 he removed to the care of the United Secession Church, Edinburgh, and afterward that of the Broughton-place Church. The burgher and anti-burgher seceders having come together in 1820, under the name of the United Associate Synod, he was chosen one of their professors of divinity in 1835. He took the part of the parent society on the division in the British and Foreign Bible Society, concerning the circulation of the Apocrypha and the voluntary side on the question of church establishments. Having, by residence within the royalty of the city of Edinburgh, become liable to the payment of an annuity tax, which was levied upon him, for the support of the city ministers, he refused to pay, and suffered his goods to be distrained; and in reply to the proceedings of the civil authorities. he preached and published two sermons on the «Law of Christ Respecting Civil Obedience, Especially in the Payment of Tribute,» which, with notes and additions, became finally an octavo volume. In 1847 he and his congregation entered the United Presbyterian Church. Other works of his are 'The Resurrection of Life' (1852); 'Expository Discourses on the Epistle of Saint Peter' (1848); 'Discourses and Sayings of Christ' (1850).

BROWN, John, American abolitionist leader: b. Torrington, Conn., 9 May 1800; d. 2 Dec. 1859. His paternal ancestry was of *Mayflower* stock, his grandmother of Welsh, his mother of Dutch. His grandfather was a captain in the Revolution. His father, who drew his abhorrence of slavery from Jonathan Edwards, an anti-slavery champion, shared in the forcible rescue of fugitive slaves in 1798. The son found his warrant against slavery in the Bible, where its defenders found their warrant for it. From the age of five he grew up in Ohio. He was an exceedingly active and adventurous boy, who loved play-fights, but not real ones, disapproved of war, and in manhood paid annual fines rather than perform militia duty. His detestation of slavery was confirmed by witnessing the abuse of a slave boy; he swore in his own words, «eternal war against slavery»; and throughout his career he never lost sight of this life-work. His 12 children who grew to maturity (out of 20 he had by two wives) were ingrained with his spirit, pledged themselves to him in prayer to spend their lives making it operative, and bore great privations to furnish him the means of so doing. He became a farmer and leather-dresser, surveyor, shepherd and wool dealer; unfixed, unprosperous and esteemed «shiftless.» This was certainly not due to indolence or lack of honor; his immense family and want of money-getting faculty were partly responsible, his absorption in a fixed idea and lack of interest in money-getting still more. By 1834, then in Pennsylvania, he had devised an association of abolitionist families to educate colored youth, believing that it would force the South into speedy emancipation. Seeking co-operation in this plan, he removed to Ohio in 1835, and to Massachusetts in 1846; in 1840 he made surveys of Oberlin College lands in Virginia and projected a negro colony there. In 1846 Gerrit Smith (q.v.) offered 100,000 acres of northern New York lands in small farms to colored families who would clear them; and in 1848, to work among them, Brown bought a farm in North Elba, where his family lived till his death, working with and for him. History can hardly parallel so large a family's unanimity of self-sacrifice for a social ideal, in whose behalf they stinted themselves ungrudgingly: a testimony to the father's commanding nobility of soul. From thence, by grace of contributions from abolitionists who had come to know and respect him, he traveled often on errands of organizing resistance to slavery. In 1850, after the passage of the Fugitive Slave Law, he visited Springfield, Mass., his former residence, and formed a «League of Gileadites,» sworn to stand by each other in the rescue of fugitive slaves.

In 1854 Kansas had become, in the eyes of both South and North, the decisive battle ground of the two systems, and five of Brown's sons living in Ohio set out thither to swell the free-soil ranks; they settled a few miles from Ossawatomie, and Brown joined them in October 1855, against his intention. The family were among the most stalwart defenders of the Territory for the next two years against the fraud and terrorism by which the Border Ruffians plunged it into anarchy and bloodshed. John Brown's career there brought him into national prominence, from the conspicuousness of the stage rather than the magnitude of the actions. Its most dramatic incidents were the retaliatory murder of five pro-slavery men at Pottawatomie, 24 May 1856, the capture of Captain Pate at Black Jack, 2 June, and the magnificent defense of Ossawatomie against a crushing force of Missourians in August. It has never been narrated, even by Northerners without sympathy for the slavery cause, except with strong partisan bias pro or con, and from its very nature, it probably never can be. The judgment passed on it depends not merely on the view taken of his cause (of which an impartial estimate is not impossible), but on the questions whether that cause would have succeeded in any event, and whether he helped or harmed it. No proof of either is possible, and favor or disfavor toward fanatical enthusiasts is one of the deepest lines of cleavage among human spirits. As the victory for freedom was won, it is the fashion to assume that it never was in doubt; that active warfare was needless; that the influx of free settlers would soon have caused the pro-slavery invaders to desist in despair; that Brown acted as a lawless ruffian who justified the other party, and that he only discredited and hampered his own side. But it is still quite rational to maintain the older view, of which the premises are certainly correct, whatever the deduction may be. The pro-slavery party had no such illusions; from the first they openly proclaimed the struggle for Kansas a war for life or death, and carried it on by the machinery of war. They constituted a government by open fraud and maintained it by open violence; sacked towns, burnt houses, assassinated some of their opponents and illegally imprisoned others; while the United States courts dispersed their foes by legal anathema, and the United States troops acted as their army. If no resistance had been offered, it is not apparent why these methods should have been less employed or less successful in 1858 than in 1856; the prize would not have been less and the incentive would have grown greater. It is certain that such peaceful submission of the free-soilers would have been hailed by the Pierce and Buchanan parties as proof incontestable that the Republican charges of illegality and outrage were mere libels. It is therefore at least arguable that it was Brown, Montgomery, Lane and the other fighters, by their stubborn and «lawless» defiance to sheer foreign conquest, plunging Kansas into open and bloody anarchy, who shamed the government into withdrawing its help to the invaders and convinced the slavery party that force was no longer available. Incidentally, they gave the non-combatants a free community in which to decry their champions.

Whatever may be the judgment now, the Eastern abolition leaders at that time had no thought of suppressing him, they furnished him some moneys and supplies for whatever plan he privately deemed best, feeling sure at least of some bold, heartening stroke for the cause. For many years he had entertained the project of establishing, in the Maryland or Virginia mountains, a stronghold for fugitive slaves, where they could withstand attacks and if necessary reach Pennsylvania. He thought the knowledge of this refuge might stimulate the slaves into a dash for freedom, and the insecurity of slave property might drive the South into emancipation. That he could suppose the United States would allow such a guerrilla fortress and firebrand within its jurisdiction for a day seems scarcely compatible with sanity, but Brown was insane only as all religious, intense idealists tend to become so. At the last, his plan developed into one for a stroke that should startle the country into action, draw recruits to him and leave no chance for compromise or delay. Characteristically, he seems not to have doubted that the country would stand by him. He chose to assault the United States arsenal at Harper's Ferry, thus not only securing arms for his presumed fugitives, but making the country ring; without reflection that this was open war against the nation, and that even the abolitionists could not uphold him. In 1857 he began drilling a small band of adherents at Tabor and Springfield, Iowa, but his trusted drillmaster, Forbes, gave the alarm, and the scheme was postponed. At length, in June 1859, he and some of his men hired a farm near Harper's Ferry, and two of his women came to keep house there; he gradually collected the remainder, 22 men besides himself, with some arms; and late Sunday evening, 16 October, with 18 men, seized the armory and took possession of the village. He made hostages of some leading citizens, and had a few neighboring planters and their slaves brought in. But the remaining citizens armed themselves, assailed and shot several of Brown's men and surrounded the rest, and on Monday evening Col. Robert E. Lee came from Washington with a company of marines and cooped Brown and his six remaining men into the engine-house. Brown fought there till the two sons with him were killed, and himself supposed to be mortally wounded, before he would surrender. Why he had not retreated to the mountains on capturing the arsenal was never explained, even by himself. He was tried before a Virginia court, but defended by Massachusetts counsel, sentenced as was inevitable and just, and hanged at Charlestown, W. Va. His testimony at the trial, and his demeanor and language all through, produced an ineffaceable impression on the North, revealing a character of heroic simplicity, purity and grandeur; if his action was mad, he himself was not; and even his adversary, Governor Wise, of Virginia, admired his «clear head, courage, fortitude and simple ingenuousness,» and felt him to be wholly truthful. The actual importance of the Harper's Ferry raid, in determining or hastening secession, has always been exaggerated, by his friends as praise and by his foes as detraction: to suppose that secession would not have come after Lincoln's election, had there been no such raid, is to ignore all American history for many years previous. But the revolt of the slave power seemed to justify his prevision and action; he became the popular incarnation of the spirit of liberty, its great pioneer and martyr; and the slogan of the North was: «John Brown's body lies a-mouldering in the grave, but his soul goes marching on!» His nature had something of the sublime; and great natures have their function and service as well as great intellects. No community could exist with such men for statesmen; perhaps none can be great without some such men for prophets.

Bibliography.— Sanborn, F. B., ‘Life and Letters of John Brown, Liberator of Kansas and Martyr of Virginia’ (Boston 1885); Burgess, ‘The Civil War and the Constitution’ (New York 1901); Rhodes, ‘History of the United States from the Compromise of 1850’ (Vol. II, New York 1893); Villard, ‘John Brown, 1800–1859: A Biography Fifty Years After’ (Boston and New York 1910).

BROWN, John, Scottish physician and essayist, son of John Brown (1784–1858, q.v.): b. Biggar, 22 Sept. 1810; d. Edinburgh, 11 May 1882. He was graduated at Edinburgh in 1833 and began practice as a physician. His leisure hours were devoted to literature, many of his contributions appearing in the *North British Review, Good Words* and other periodicals. His collected writings, published under the title of ‘Horæ Subsecrivæ’ (leisure hours) (1858–82), embrace papers bearing on medicine, art, poetry and human life generally. Several of his sketches, such as ‘Rab and His Friends,’ ‘Our Dogs,’ ‘Pet Marjory,’ ‘Jeems the Doorkeeper,’ on which his fame chiefly rests, have been published separately. Humor, tenderness and pathos are his chief characteristics. Consult Peddie, ‘Recollections of Dr. John Brown’ (1893); M’Laren, E. T., ‘Dr. John Brown and His Sister Isabella’ (4th ed., 1890); Forrest, D. W. (editor), ‘Letters of Dr. John Brown,’ with a biography by E. T. M’Laren (1907).

BROWN, John George, Anglo-American painter: b. Durham, England, 1831; d. 1913. He was educated in the common schools in Newcastle-on-Tyne and came to the United States in 1853. He studied in the schools of the National Academy of Design, was elected an academician in 1863, received honorable mention at the Paris Exposition in 1899 and in 1900 was president of the American Water Color Society. He is best known for his pictures of bootblacks and street urchins. Among his famous pictures are ‘A Merry Air with a Sad Heart,’ ‘The Stump Speech,’ ‘The Passing Show,’ ‘Be Mine’ and ‘Training the Dogs.’

BROWN, John Hamilton, American inventor: b. Liberty, Me., 28 July 1837. At the age of 18 he was apprenticed to a gunsmith and in 1857 entered business in Haverhill, Mass. He served in the Civil War as a sharpshooter and in 1882 was a member of the American rifle team at Wimbledon. He devised a combination pleating machine and rotary ruching press. He began in 1883 to perfect the invention of a weapon for military use later known as the Brown segmental wire-wound gun, which after numerous government tests was pronounced a success.

BROWN, John Howard, American editor: b. Rhinebeck, N. Y., 8 Nov. 1840; d. 22 April 1917. He studied law; was a journalist in Washington, D. C., and Augusta, Ga., and later a publisher in New York. In 1896 he removed to Boston to become editor-in-chief of ‘Lamb’s Biographical Dictionary of the United States.’ He edited in New York *Americana*, a monthly magazine of history, genealogy and literature (1912, 1913 and 1914) and assisted in editing ‘History of German-American Families in the United States’ (Carl Wilhelm Schlegel, editor-in-chief), volume I of which work was issued in 1916. He is the author of ‘American Naval Heroes’ (1896) and of numerous contributions to periodical literature.

BROWN, John Lewis, French artist: b. Bordeaux, 16 Aug. 1829; d. 1892. He studied under Belloc and Roqueplan and was famous as an impressionist painter of military and hunting scenes, as well as of studies of horses and dogs. Among his numerous works are ‘Steeple Chase’ (1861); ‘At the Outposts’ (1865); ‘Relay of Omnibus Horses’ (1884); ‘Hohenlinden’ (1887).

BROWN, John Young, American lawyer: b. Claysville, Hardin County, Ky., 28 June 1835; d. Henderson, Ky., 11 Jan. 1904. He was graduated at Centre College, Danville, 1855, studied law and was admitted to the bar. In 1859 he was elected to Congress, but not having attained the constitutional age, could not take his seat. He was again elected to Congress in 1868, but his seat was refused him by the House because of political disabilities. Finally he served in Congress (1873–77). He retired to the practice of law and during 1891–95 he was Democratic governor of Kentucky.

BROWN, Joseph Emerson, American statesman: b. Pickens County, S. C., 15 April 1821; d. Atlanta, Ga., 30 Nov. 1894. He was educated at Calhoun Academy and was graduated at Yale in 1846. He settled in Canton, Ga., served in the State legislature and was elected governor in 1857, serving three terms. As war governor he opposed Jefferson Davis in the matter of the conscription laws and raised 10,000 recruits to oppose Sherman’s march to the sea, but would not allow them to leave the State. After the war he gave hearty support to the reconstruction measures and supported General Grant for the Presidency. He was chief justice of Georgia in 1868 and United States senator in 1880–91. He made large gifts for religious and educational purposes. Consult Fielder, ‘Life and Times of Joseph E. Brown’ (Springfield 1883).

BROWN, Kenneth, American journalist and novelist: b. Chicago, 9 March 1868. After studies in Germany, Switzerland, Paris, at Harvard University and the University of Virginia, he engaged in journalism in Boston, New York, Baltimore and Chicago, and from 1898 to 1900 was editorial writer on the staff of the New York *Commerical Advertiser.* He is co-author with Henry Burnham Boone of ‘Eastover Court House’ (1901) and ‘The Redfields Succession’ (1903); co-author with his wife of ‘The First Secretary’ (1907) and ‘The Duke’s Price’ (1910), and author of ‘Sirocco’ (1906) and of ‘Two Boys in a Gyrocar’ (1911).

BROWN, Lancelot, English landscape gardener, sometimes called «Capability Brown»: b. at Harle-Kirk 1715; d. 1773. He commenced life as a kitchen gardener, but by his industry and genius rose rapidly in public estimation till he came to be regarded as a kind of oracle in taste in regard to all rural improvements — agricultural, horticultural and even architectural. His extensive employment enabled him to realize a handsome independence, and he adorned the station to which he had worked his way with more graces and virtues than are often displayed by those who have been born to it. He obtained the dignity of high sheriff of Huntington in 1770. He avoided the stiff formality of the older landscape gardens but is charged with having often sinned against good taste by endeavoring to reform natural scenery and force it, under all circumstances, to assume the form of clumps, belts and serpentine canals. His architectural performances are remarkable for their interiors. A full list of his works is given by Repton, ‹Landscape Gardening and Landscape Architecture› (ed. by J. C. Loudon 1840, pp. 30, 266, 327, 520).

BROWN, Moses, American naval officer: b. Salisbury, Mass., 20 Jan. 1742; d. at sea, 1 Jan. 1804. He was a sailor in early life and commanded the United States privateer *General Arnold.* He was the first commander of the sloop of war *Merrimac,* having the rank of captain, United States Navy. He captured four French vessels during 1799–1801. He was retired by Thomas Jefferson and re-entered the merchant service.

BROWN, Nicholas, American merchant and philanthropist: b. Providence, R. I., 4 April 1769; d. there, 27 Oct. 1841. He was graduated at Rhode Island College 1786. Through the death of his father in 1791, he inherited a handsome fortune, formed a partnership with his brother-in-law, Thomas P. Ives, and became one of the most successful and best-known merchants of America. He was a nephew of John Brown (1736–1803, q.v.). In 1792 he gave $500 to Rhode Island College with which to purchase law books. This was the beginning of a long series of endowments and benefactions to that institution, which took his name in 1804, when he endowed a professorship of oratory and *belles-lettres.* In 1822 he built Hope College, at an expense of $20,000, Manning Hall in 1834 at a cost of $18,500 and a president's house in 1840, costing $7,000. The total of his various gifts amounted to $160,000. He was a trustee from 1791 to 1825, a fellow 1825–41 and a most efficient treasurer from 1796 to 1825. He was also a generous donor to the Providence Athenæum and Butler Hospital for the Insane. He served several terms in the State legislature, and in 1840 was a presidential elector. Consult Hunt, ‹Lives of American Merchants› (New York 1856).

BROWN, Oliver Madox, English artist, son of Ford Madox Brown (q.v.): b. 1855; d. 1874. From early boyhood he showed remarkable capacity both in painting and literature, especially prose fiction and poetry. His two most promising pictures were ‹The Tempest — Prospero and the Infant Miranda› (exhibited in 1871 at the International Exhibition, South Kensington), and ‹A Scene from Silas Marner› (1872). ‹Gabriel Denver› (1873) and some other unfinished novels, besides sonnets and other poems, show wonderful literary power in one so young. His ‹Literary Remains› were published in 1876. Consult Ingram, H., ‹O. M. Brown: A Biographical Sketch› (*Scribner's Magazine,* Vol. XII, pp. 425–28, 1876).

BROWN, Peter Hume, British histographer: b. Haddingtonshire, Scotland, 17 Dec. 1850. He was graduated from Edinburgh University and became a teacher and journalist. He was appointed register of the Privy Council of Scotland (1898), and in 1908 he became histographer royal for Scotland. He has been professor of ancient Scottish history and palæography in Edinburgh University since 1901, and he was Ford lecturer 1913–14. Among his more important works are ‹George Buchanan, Humanist and Reformer› (1890); ‹Early Travelers in Scotland› (1891); ‹Scotland before 1700› (1893); ‹History of Scotland› (1898–1909); ‹Scotland in the Time of Queen Mary› (1903–04); ‹The Youth of Goethe› (1913), and ‹Ford Lectures› (1914).

BROWN, Phœbe Allen Hinsdale, American hymn writer: b. Canaan, N. Y., 1 May 1783; d. Marshall, Ill., 10 Oct. 1861. In 1805 she married Timothy H. Brown, a painter, who moved about considerably with his family. Amid this shiftless life she succeeded in educating her children, one of whom, S. R. Brown, became the first American missionary to Japan. Mrs. Brown was quite a voluminous writer. She has left several volumes in prose, an ‹Autobiography› and a volume of poems. She has been called the best writer of hymns in America.

BROWN, Robert, Scottish botanist: b. Montrose, 21 Dec. 1773; d. London, 10 June 1858. He finished his education in 1795, when he became ensign and assistant surgeon in a Fifeshire fencible regiment, which he accompanied to Ireland, remaining there till 1800. He was then, through the influence of Sir Joseph Banks, appointed naturalist to Captain Flinders' surveying expedition to Australia or New Holland. The whole continent of Australia was circumnavigated, the coast at various points examined, and Brown remained in the colony, visiting various parts of New South Wales and Van Diemen's Land, till 1805. He returned with nearly 4,000 species of plants, was shortly after appointed librarian to the Linnæan Society and was now able to devote himself to the systematic study of his plants. He continued to make the result of his investigations known in communications to the Linnæan and Royal societies. One of his earliest papers was on a group of the family of plants named by Jussieu *Apocyneæ,* which he succeeded in establishing as a separate family under the title already given them by Jussieu of *Asclepiadeæ.* In 1810 he published the first volume of the great work he had been preparing on the plants of Australia and Tasmania, entitling it ‹Prodromus Floræ Novæ Hollandiæ et Insulæ Van Diemen.› No second volume of it ever appeared. He was the first English writer on botany who adopted the natural system of classification which has since entirely superseded that of Linnæus. In 1814 he published a botanical appendix to Captain Flinders' account of his voyage, entitled ‹General Remarks, Geographical and Systematical, on the Botany of Terra Australis.› In 1828 he published a brief ‹Account of Microscopical Observations on the Particles Contained in the Pollen of Plants, and on the General Existence of Active Molecules in Organic and Inorganic Bodies.› He was the first to call attention to the presence of these active molecules. The movement of the granules of the fovilla (or semi-fluid matter contained in the pollen grains) which he believed to be purely physical, or non-organic, has on the Continent acquired the name of the

Brownian or Brunonian movement. He also wrote botanical appendices for the voyages of Ross and Parry, the African exploration of Denham and Clapperton and others, and described, with Dr. Bennet, the plants collected by Dr. Horsfield in Java. In 1810 he received the charge of the collections and library of Sir Joseph Banks, which were afterward bequeathed to him for life. He transferred them in 1827 to the British Museum and was appointed keeper of botany in that institution. He became a fellow of the Royal Society in 1811, D.C.L. of Oxford in 1832, a foreign associate of the French Academy of Sciences in 1833. He had the Copley medal in 1839 and was appointed president of the Linnæan Society in 1849. He also received the decoration of the highest Prussian order of civil merit, presided over by Baron Humboldt, who called him *Botanicorum facile princeps*. As a botanist Brown occupied the very highest rank. He made the microscope and the study of development the basis of his classification, and by his skill in the application of ascertained facts to the elucidation of obscure and the explanation of doubtful phenomena, greatly advanced our scientific knowledge of the vegetable kingdom. His works, contained chiefly in the 'Transactions' of learned societies and other inaccessible forms, are not of a nature to be popular. See BROWNIAN MOVEMENT.

BROWN, Robert, Scottish scientist: b. Campster, Caithness-shire, 1842; d. 1896. He explored the coast of Spitzbergen, Greenland, and the western shore of Baffin Bay in 1861, made charts of the interior of Vancouver, and with Whymper, in 1867, made discoveries as to the inland ice of Greenland, since borne out by those of Peary. He traveled extensively in the Barbary States, lectured on scientific themes in Glasgow and Edinburgh and was a member of learned societies in Europe and America. He published 'Manual of Botany' (1874); 'Peoples of the World' (1882–85); 'Science for All' (1877–82); 'The Story of Africa and Its Explorers' (4 vols., 1892–95; new ed., 1911).

BROWN, Samuel, American physician: b. Rockbridge County, Va., 30 Jan. 1769; d. 12 Jan. 1830. He was graduated at Dickinson College in 1789, studied medicine in Scotland and practised in Kentucky, Louisiana and Mississippi. He became professor of medicine in Transylvania University in 1819; established a medical school in Lexington, Ky., of which he was president until 1825, and organized the first medical society in Lexington. He introduced the method of preparing ginseng for medicine, and contributed to medical journals. He labored for the abolition of slavery.

BROWN, SIR Samuel, English engineer: b. London 1776; d. Blackheath, Kent, 15 March 1852. After serving with honor in the English navy, he was made a retired captain in 1842. He is remembered for his system of making iron chain cables and as the designer and builder of the earliest iron suspension bridge in England, at Berwick-on-Tweed. The famous chain pier at Brighton was designed by him. He was knighted in 1838.

BROWN, Samuel, Scottish chemist and poet: b. Haddington, 23 Feb. 1817; d. Edinburgh, 20 Sept. 1856. He was graduated from the University of Edinburgh with extraordinary attainments, began his public career by delivering, in 1840, in association with his intimate friend, Edward Forbes, a course of lectures on the philosophy of the sciences; and having established among his auditors, as he had before among his teachers, the conviction that he was destined to great achievement, renounced all else that he might have won, to devote himself to the slow experimental realization of a great scientific conception. In 1849 he delivered in Edinburgh a series of lectures on the history of chemistry, tracing its progress from its playful childhood among the Greeks, through the Oriental and mediæval alchemists, with most fascinating sketches of Roger Bacon and Paracelsus; passing thence through the epoch of Stahl and Priestley, till the young and unfortunate Lavoisier changed the whole form of chemical science, opening a new path to all succeeding philosophers. In 1850 he published the 'Tragedy of Galileo.' Many of his lectures and essays have been collected since his death, under the title of 'Lectures on the Atomic Theory, and Essays Scientific and Literary.'

BROWN, Samuel Robbins, American scholar, educator and missionary: b. East Windsor, Conn., 16 June 1810; d. Munson, Mass., June 1880. His mother was Phœbe Hinsdale, one of the first and best known of American hymnologists. Educated at Munson Academy, Yale College and the Theological Seminary at Columbia, S. C., he supported himself most of the time by teaching music. He sailed with his young bride in 1838 to China and at Macao organized and taught in the school of the Morrison Education Society, which was later removed to Hongkong, where Dr. Brown was wounded by pirates. He established the first Christian Protestant school in China, brought the first Chinese students to America for education and was the chief instrument in establishing (at Elmira, N. Y.) the first women's college in America chartered as such. He translated the New Testament into Japanese 13 days after the formation of the American Board of Commissioners for Foreign Missions. He returned to America in 1847, bringing with him Yung Wing (who afterward brought 120 Chinese students to America) and Wong, who became a famous physician. Most of Dr. Brown's Chinese pupils rose to positions in the Imperial Customs and other government services which required a knowledge of English. Remaining in America until 1859, as pastor and teacher at Owasco Lake, N. Y., he went out to Japan to found the mission of the Reformed Church in America. He trained a native ministry and many Japanese pupils who have since become editors, statesmen, scholars, presidents of colleges or otherwise active in the remaking of the Japanese empire. He wrote the first 'Grammar of Colloquial Japanese' and other works for the mastery of the language, and made scholarly translations. Consult Griffis, W. E., 'A Maker of the New Orient' (1902).

BROWN, Sanger, American physician: b. Bloomfield, Ontario, 16 Feb. 1852. He was graduated from the Bellevue Hospital Medical College, New York, 1880, and has since held several important professional posts, becoming professor of neurology in the Post-Graduate Medical School of Chicago in 1890, and in 1901–06 was associate professor of medicine and clinical medicine at the College of Physicians and Surgeons in the same city. He was the earliest to demonstrate that the occipital lobe is the centre of vision in monkeys. In 1908 he joined the United States Army Medical Reserve Corps with rank of first lieutenant.

BROWN, Stimson Joseph, American mathematician and astronomer: b. Penn Yan, N. Y., 17 Sept. 1854. He studied at Cornell University and at the United States Naval Academy; served on the United States Coast and Geodetic Survey, was appointed professor of mathematics 1883, and astronomical director of the United States Naval Observatory 1898, and after six years' service in the United States Naval Academy from 1901, was appointed head of the department of mathematics and mechanics in 1907. Among his published service textbooks are ‹Practical Algebra› (1908, 1910); and ‹Analytical Geometry and Curve Tracing› (1907; rev. ed., 1912).

BROWN, Thomas, Scotch metaphysician: b. Kirkmabreck, Kirkcudbright, 9 Jan. 1778; d. London, 2 April 1820. He was educated at the University of Edinburgh, where he obtained the professorship of moral philosophy. He distinguished himself, at a very early age, by an acute review of the medical and physiological theories of Dr. Darwin, in a work entitled ‹Observations on Darwin's Zoonomia.› But he chiefly deserves notice on account of his metaphysical speculations, his chief work being ‹Lectures on the Philosophy of the Human Mind› (1822). His system reduces the intellectual faculties to three great classes — perception, simple suggestion and relative suggestion, employing the term suggestion as nearly synonymous with association. His development of the theory of cause and effect was first suggested by Hume.

BROWN, Thomas Edward, English poet: b. Isle of Man 1830; d. Clifton, England, 29 Oct. 1897. After a brilliant career at Christ Church College, Oxford, he became assistant master at Clifton College, Bristol, in 1862, resigning in 1892. His work, though strong and remarkably original, failed to attract general attention during his lifetime, but when collected in 1900, contemporaneously with two volumes of his ‹Letters,› they drew forth extended notices from leading critical reviews and journals in England and the United States. His poems, written in Anglo-Manx dialect for the most part, are chiefly narrative, and include ‹Betsy Lee› (1873); ‹Fo'c's'le Yarns, including Betsy Lee› (1881); ‹The Doctor and Other Poems› (1887); ‹The Manx Witch and Other Poems› (1889); ‹Old John and Other Poems› (1893). Consult ‹Collected Poems and Letters› (London and New York 1900).

BROWN, Sir William, English merchant and philanthropist: b. Ballymena, Ireland, 1784; d. 1864. In 1800 he removed with his parents to Baltimore, Md., and became the partner of his father in the linen trade there. In 1809 he set up a branch of the business in Liverpool and subsequently founded the famous mercantile house of Brown, Shipley & Company. He sat in Parliament four years from 1846, advocated free trade and decimal coinage, gave $200,000, in 1857, to establish a free public library in Liverpool, and built the original library building and museum there. He was knighted in 1863.

BROWN, William Adams, American Presbyterian theologian and author: b. New York city, 29 Dec. 1865. He studied at Yale University, Union Theological Seminary, and in Berlin, Germany; began teaching at the Union Seminary in 1892; and the following year was ordained to the Presbyterian ministry. In 1898 he became professor of systematic theology at Union Seminary. A contributor to Hastings' ‹Dictionary of the Bible,› Hastings' ‹Encyclopedia of Religion and Ethics,› to the *American Journal of Theology,* and the *Harvard Theological Review,* his advanced views as expressed in his writings aroused the opposition of a conservative element in the Presbyterian Church, who subjected him to caustic criticism at the General Assembly of 1913. His published works include ‹The Essence of Christianity› (1902; new ed., 1913); ‹Christian Theology in Outline› (1906); ‹Christian Hope: a Study in the Doctrine of Immortality› (1912); ‹Modern Theology and the Preaching of the Gospel› (1914).

BROWN, William Garrott, American writer: b. Marion, Ala., 24 April 1868; d. 20 Oct. 1913. He was graduated at Harvard in 1891, taking highest honors in history, and became assistant in the Harvard Library, serving till 1900, when he was appointed lecturer on American history. In 1892 he took an active part in the Presidential campaign, serving on various committees and stumping Massachusetts in behalf of Cleveland. He made a special study of Southern history, and after 1900 devoted himself to writing and lecturing on this topic, contributing chiefly to the *Atlantic Monthly.* His writings in book form are ‹Andrew Jackson› (1900); ‹History of Alabama› (1901); ‹The Lower South in American History (1902); ‹Stephen A. Douglas› (1902); ‹Golf› (1902); ‹History of the United States since the Civil War› (1903); ‹A Gentleman of the South› (1903); ‹The Foe of Compromise, and Other Essays› (1903); ‹Life of Oliver Ellsworth› (1905).

BROWN, William George, American chemist: b. Newcastle-on-Tyne, England, 5 Nov. 1853. Coming with his parents to Virginia in 1869, he studied at the University of Virginia, at Harvard University and at Heidelberg. He held appointments in the East Tennessee University, the University of Tennessee, University of Virginia, South Carolina Military Academy; was professor of chemistry at Washington and Lee University from 1886 to 1894; assistant chemist in the United States Department of Agriculture 1894 to 1896; in the latter year going to the University of Missouri as professor of chemistry; in 1905 being appointed director of laboratories and in 1910 professor of industrial chemistry. He edited *University of Missouri Studies* (1904–11) and published ‹Chemistry› (1912).

BROWN, William Montgomery, American Protestant Episcopal bishop: b. Orrville, Ohio, 4 Sept. 1855. He was educated at Seabury Hall, Faribault, Minn., and at Gambier, Ohio. He entered the Episcopal ministry, was rector at Galion, Ohio, 1883–91, became archdeacon of Ohio in 1891, and in 1898 was consecrated coadjutor bishop of Arkansas; becoming bishop of that diocese in the year following. Owing to ill health he retired in 1912, and took up his residence at Galion, Ohio. He published 'The Church for Americans' (1895); 'The Crucial Race Question' (1907); 'The Level Plan for Church Union' (1910).

BROWN, the color produced when certain substances— wood or paper, for example — are scorched or partially burned. Brown is not one of the primary colors in a spectrum. It is composed of red and yellow, with black, the negation of color. It is also the name of a genus of colors, of which the typical species is ordinary brown, tinged with gray or black. The other species are chestnut brown, deep brown, bright brown, rusty, cinnamon, red brown, rufous, glandaceous, liver-colored, sooty and lurid.

BROWN COAL. See Coal, Varieties of.

BROWN-SÉQUARD, sā'kär', **Charles Edouard**, French-American physician and physiologist: b. Port Louis, 8 April 1817; d. Sceaux, near Paris, 2 April 1894. His father, a Philadelphian, was a captain in the merchant marine, his mother a Séquard, was French. He took his M.D. degree in Paris in 1840, and thereafter devoted his attention to experimental physiology, achieving wide fame by his contributions to racial knowledge on the spinal cord and the nervous system, on blood and animal heat. As professor at Harvard University 1864 to 1868; in Paris from 1869; in New York as medical practitioner from 1873 to 1878; from 1878 as professor at the Collège de France, he led a diversified and useful life, somewhat marred in his old age by his advocacy of the derisively styled 'Brown-Sequard Elixir,' for prolonging life, a fluid of animal seminal origin, which was to be used as a hypodermic injection. From 1858 to 1863 he edited the *Journal de la Physiologie de l'Homme et des Animaux* which he founded; he published 'Lectures on the Diagnosis and Treatment of the Principal Forms of Paralysis of the Lower Extremities' (1861); and in 1869 founded *Archives de la Physiologie Normale et Pathologique* which contain about 500 of his essays and articles describing his researches.

BROWN SPAR, a name given to the brown varieties of dolomite whose color is due to the presence of iron carbonate.

BROWN THRUSH, or **THRASHER.** See Thrasher.

BROWN UNIVERSITY, an educational institution in Providence, R. I. Its charter was granted by the general assembly of the State in 1764 and the institution was opened in Warren in 1765 as Rhode Island College. Its founding was due to the wish of the Baptists to have a college under their own control and it has ever since been affiliated with the Baptist Church, although remaining unsectarian. The college was removed to Providence in 1770 and in 1804 its name was changed to Brown University in honor of Nicholas Brown (q.v.), whose various gifts to the college were not far from $160,000 in amount. Under its 4th president, Francis Wayland (q.v.), 1827–55, the university was practically reorganized. Under President Elisha Benjamin Andrews (q.v.), 1889–98, the number of students increased from 268 to 860. In 1891 the Women's College was founded, and in 1897 this was accepted by the corporation as the Women's College in Brown University. Since the presidency of the Rev. W. H. P. Faunce began in 1899, the institution has grown very rapidly; over $3,000,000 has been added to the endowment and several large and important buildings have been erected, including the John Carter Brown Library, the Administration Building, the Engineering Building, Caswell Hall, Rockefeller Hall, the John Hay library, and the Arnold Biological laboratory. At the end of 1915 there were 114 professors and instructors, 1,114 students in all departments; in 1915 the productive funds were $4,566,000, and there were 235,000 volumes in the library.

BROWNE, Charles Farrar («Artemus Ward»), American humorist: b. Waterford, Me., 26 April 1834; d. Southampton, England, 6 March 1867. He learned the printer's trade, and while working on the *Carpet Bag*, a Boston comic weekly, began his career as one of the most widely popular of American writers and lecturers. 'Artemus Ward's Sayings,' written for the Cleveland *Plain Dealer*, extended his fame as a clever and witty writer. In 1860, he moved to New York and joined the editorial staff of *Vanity Fair*. His humorous lectures, especially those on Mormonism, proved most successful in this country and in England. He died of consumption while on a lecture tour in the latter country. Browne's humor had a quality of its own, and was essentially democratic and American. His winning personality never failed to put an audience in a receptive mood. His works in book form are 'Artemus Ward: His Book' (1865); 'Artemus Ward: His Travels Among the Mormons' (1865); 'Artemus Ward: His Book of Goaks' (1865); 'On the Rampage' (1865); 'Artemus Ward Among the Fenians' (1865); 'Artemus Ward in London' (1867); 'Artemus Ward's Lecture at Egyptian Hall' (1869). While in England he made several contributions to *Punch*, beginning with the number for 1 Sept. 1866. Later editions of his works are numerous. Consult M. D. Landon's biographical sketch, prefixed to 'Artemus Ward, His Works Complete' (1875).

BROWNE, Edward Granville, English Orientalist: b. Uley, England, 7 Feb. 1862. He was educated at Eton and Pembroke College, Cambridge. He traveled in Persia (1887–88), becoming lecturer in Persian at Cambridge in the year last named. He has published 'A Travelers' Narrative, Written to Illustrate the Episode of the Báb' (Persian text and English translation with notes, 1891); 'The New History of Mirzá and Ali Muhammad the Báb' (1893); 'A Year Amongst Persians' (1893); 'Literary History of Persia' (1906); 'Recent Events in Persia' (1909); 'History of the Persian Revolution, 1905–09' (1910); 'The Press and Poetry of Modern Persia' (1914).

BROWNE, Edward Harold, English prelate: b. Aylesbury, Buckinghamshire, 6 March 1811; d. Winchester, Hampshire, 19 Dec. 1891. He was educated at Emmanuel College, Cambridge, took orders in the Anglican Church in

1836, and was consecrated bishop of Ely in 1864. In 1843, he became professor of theology at the College of Saint David and in 1854, at Cambridge University. In 1873, he was transferred to Winchester, resigning this bishopric in 1891. He was a prominent advocate of the old Catholic movement in Germany and one of the Old Testament company of revision of the King James version of the Bible. He published ‘An Exposition of the XXXIX Articles’ (1850–53); ‘Sermons on the Atonement and Other Subjects’ (1859); ‘The Messiah Foretold and Expected’ (1862); ‘The Pentateuch and the Elohistic Psalms in Reply to Bishop Colenso’ (1863); ‘The Stripe, the Victory, and the Kingdom’ (1872); ‘Position and Parties of the English Church’ (1875); ‘Commentary on Genesis’ in the ‘Speaker's Commentary.’

BROWNE, Francis Fisher, American editor and author: b. South Halifax, Vt., 1 Dec. 1843; d. 11 May 1913. During the Civil War he served in the 46th Massachusetts Volunteers. He edited the *Lakeside Monthly,* 1869–74, and in 1880 became editor of *The Dial,* Chicago, which under his direction came to be one of the two or three American literary journals worthy of being ranked with the best English periodicals of similar scope. His publications are ‘Everyday Life of Abraham Lincoln’ (1886); ‘Volunteer Grain’ (1896) and poems. He edited ‘Golden Poems by British and American Authors’ (1881); ‘Golden Treasury of Poetry and Prose’ (1883); ‘Bugle Echoes: a Collection of Poems of the Civil War’ (1886).

BROWNE George Forrest, English bishop: b. York, England, 1833. He was educated at Saint Catharine's College, Cambridge, and ordained 1858. He was appointed theological tutor and Bell lecturer in ecclesiastical history in the Episcopal Church of Scotland, 1862; fellow and lecturer at Saint Catharine's, 1863–65; rector of Ashley, 1869–75; Disney professor of archæology, 1887–92; canon of Saint Paul's, 1891–97; bishop of Stepney, 1895–97; and bishop of Bristol, 1897–1914. He is the author of ‘Ice Caves of France and Switzerland’ (1865); ‘The Venerable Bede’ (1879); ‘University Sermons’ (1878–80); ‘The Ilam Crosses’ (1889); ‘Early English Church History’ (1893); ‘The Church at Home Before Augustine’ (1894); ‘Augustine and His Companions’ (1895); ‘Conversion of the Heptarchy’ (1896); ‘Theodore and Wilfrith’ (1897); ‘History of Saint Catharine's College’ (1902); ‘Life and Works of Saint Aldhelm,’ and various publications of the Church History Society (1894–97).

BROWNE, George Waldo, American author: b. Deerfield, N. H., 8 Oct. 1851. For five years he edited *American Young Folks,* and is a well-known writer for young people under the *nom-de-plume* of “Victor St. Clair.” At present he is editor of *New England and Granite State Magazine.* He has written over 100 serials and several hundred short stories for leading juvenile periodicals. Of his best-known books are ‘The Woodranger Tales’ (4 vols., 1899–1902); ‘Two American Boys in Hawaii’ (1899); ‘New America and the Far East’ (10 vols., 1902–06); ‘Paradise of the Pacific,’ ‘Pearl of the Orient’ (1902); ‘History of the Saint Lawrence River’ (1904); ‘Japan, the Place and the People’ (1906); ‘Ruel Durkee’ (1910); ‘China, the Country and the People’ (1912); ‘Keepers of the Wilderness’; ‘Amoskeag Manufacturing Company, a History’ (1915). He has compiled and edited 15 volumes of local history. His most recent juveniles include ‘For Home and Honor,’ ‘Post Boy of the Kenewah,’ ‘From Switch to Lever,’ ‘Comrades under Castro,’ ‘Zip the Acrobat,’ ‘Castaway in the Jungle,’ ‘With Rogers' Rangers’ (1905).

BROWNE, Hablot Knight, English caricaturist, better known by his pseudonym of PHIZ: b. London, 15 June 1815; d. Hove, Brighton, 8 July 1882. He was educated at a private school, and at an early age began to draw caricatures with great spirit. In 1835 he succeeded Seymour as the illustrator of Dickens' ‘Pickwick,’ and so happy and successful was his pencil that he was engaged to illustrate ‘Nicholas Nickleby’; ‘Dombey and Son’; ‘Martin Chuzzlewit’; ‘David Copperfield,’ and other works of that great novelist. He subsequently contributed many graphic illustrations to the novels of Lever, Ainsworth, Scott (the Abbotsford edition of the Waverley Novels), and to an illustrated edition of Byron, besides sending many comic sketches to the illustrated serials of the time. Consult Thompson, ‘Life and Labors of H. K. Browne’ (1884).

BROWNE, Isaac Hawkins, English poet: b. Burton-on-Trent, Staffordshire, 1706; d. London, 14 Feb. 1760. He was educated at Trinity College, Cambridge, and called to the bar, but he did not practise. He wrote ‘Design and Beauty’; ‘The Pipe of Tobacco’ (in which he imitates Pope, Young, Swift and others); and a Latin poem, ‘De Animi Immortalitate,’ modeled on Lucretius and Virgil. The last-named received high commendation from the scholars of his time, and has been several times translated into English. Browne had a great reputation as a wit and conversationalist. His works were collected and published by his son (1768).

BROWNE, John Ross, American author and traveler: b. Ireland 1817; d. Oakland, Cal., 9 Dec. 1875. He came to America when a child, his father settling in Kentucky. At the age of 18, having learned stenography, he went to Washington and for several years was employed as shorthand reporter in the Senate. His desire for travel led him to take a whaling cruise, in the course of which he visited the greater part of the world. In 1849 he was a government commissioner in California, and reported the State Constitutional Convention proceedings. In 1851, and again in 1861, he traveled extensively in Europe and the Holy Land, visiting Iceland, Russia, Poland and other countries. Commissioned by the government to study the mineral resources west of the Rocky Mountains, he presented an elaborate report, reviewing the mines, climate, topography, agriculture, commerce, etc., of that region. His books of travel were illustrated with humorous drawings of his own. He was United States Minister to China in 1868–69. His publications include ‘Etchings of a Whaling Cruise’ (1846); ‘Yusef: a Crusade in the East’ (1853); ‘Adventures in the Apache Country’ (1859); ‘The Land of Thor’ (1866); ‘Adventures of an American

Family in Germany' (1867); 'Crusoe's Island, with Sketches of Adventures in California and Washoe' (1864); 'Resources of the Pacific Slope' (1869).

BROWNE, Junius Henri, American journalist: b. Seneca Falls, N. Y., 14 Oct. 1833; d. New York, 2 April 1902. He was a graduate of Saint Xavier College, Cincinnati. In 1861 he became war correspondent for the New York *Tribune,* was wounded at Fort Donelson, and taken prisoner while engaged in an abortive expedition to run the Vicksburg batteries. After an imprisonment of 20 months in seven different prisons, he eluded his guard at Salisbury, N. C., traveled 400 miles through a hostile country, and reached the Union lines 14 Jan. 1865. His list of Union soldiers who died at Salisbury, published in the *Tribune,* is the only authentic account of their fate. After the war he served as correspondent of the New York *Tribune, Times* and other journals, and contributed many articles to leading periodicals. His best-known works are 'Four Years in Secessia' (1865); 'The Great Metropolis: A Mirror of New York' (1869); 'Sights and Sensations in Europe' (1872). A series of articles on women, which he wrote for the *Galaxy,* created a sensation in literary circles. His 'Four Years in Secessia' was hastily prepared and lacked much grace and elegance in its literary form, but its descriptions of various incidents of the war and particularly its information concerning the conditions of the Southern prisons and the Northern soldier confined in them, render the book especially valuable.

BROWNE, Robert, earliest separatist from the Church of England and the reputed founder of Congregationalism: b. Tolethorpe, Rutlandshire, about 1550; d. about 1633. He was graduated at Christ's College, Oxford, in 1572, and was afterward ordained. He preached at Islington without episcopal license, and also in Cambridgeshire, where he denounced alike ordination by bishop and presbytery and the parochial system. He carried matters to extremities by destroying a license to preach which his brother had secured for him from the bishop of Ely. With Robert Harrison he went to Norwich about 1580 and founded a «church» popularly known as the «Brownists.» He was twice imprisoned for seditious preaching at Bary Saint Edmunds, and on both occasions was released through the influence of Cecil, Lord Burleigh, to whom he was related. He emigrated to Middleburg with a large section of his congregation in 1581; but dissensions there occasioned his going to Scotland in 1583, where he also suffered imprisonment and on his release returned to England. He was excommunicated by the bishop of Peterborough in 1586 for ignoring an episcopal citation, then made submission, conformed and gave no further trouble to the ecclesiastical authorities, and was successively master of Stamford grammar school and rector of Achurch, Northamptonshire. He is reputed to have died in Northampton jail following an assault on a constable during an outburst of temper.

BROWNE, Sir Thomas, English prosaist, scholar and physician: b. 19 Oct. 1605, London, parish of Saint Michael, Cheapside; d. Norwich, 19 Oct. 1682. His father, who had been a mercer at Upton, in Cheshire, and came of an ancient and honorable family, died early; and Browne's mother soon married Sir Thomas Dutton. Browne received his early education at Winchester College, and in 1623 was sent as a fellow-commoner to Broadgate Hall (now Pembroke College) Oxford. Here he was graduated B.A., in June 1626, and M.A. 11 June 1629. Early becoming interested in the natural sciences, he devoted most of his time at Oxford to the study of medicine, and for some time after graduation practised medicine in Oxfordshire. Later on, he accompanied his stepfather to Ireland on a tour of inspection of its forts and castles. After this, Browne continued his travels through France and Italy, spending some time at the celebrated schools of physic at Montpellier and Padua, and doubtless acquiring some of the «six languages» which, «besides the jargon and patois of several provinces,» he later stated that he understood. On his way back to England he traveled through Holland, where in 1633 the University of Leyden conferred upon him the degree of doctor of medicine. After his return, he established himself as a physician at Shipden Hall, near Halifax. He was much «resorted to for his skill in physic,» and spent his leisure hours in study and contemplation.

At Shipden Hall, 1635–36, Browne composed the beautiful contemplative soliloquy known as the 'Religio Medici.' It was written for his «private exercise and satisfaction,» and was not intended for publication. It was, however, widely circulated in manuscript among his literary friends, and was surreptitiously published in 1642 by Andrew Cooke. Browne, in self-defense, published an authorized edition in 1643; and almost simultaneously appeared a series of «Observations» on the work, penned in 24 hours by the eminent Sir Kenelm Digby. The book at once attracted the cultured class, both at home and abroad. In 1664, John Merryweather published a Latin version of it; and Dutch, French and German translations appeared in 1665, 1668 and 1680, respectively. Because of the «daring skepticism» which it combined with «implicit faith in revelation,» it was placed in the Index Expurgatorius of the Catholic Church. Between 1642 and 1881, the treatise ran through 33 English editions.

In 1637 Browne had moved to Norwich, where he practised medicine and pursued his literary studies till his death. On 10 July 1637, he was incorporated doctor of physic at Oxford. He married, 1641, Dorothy, 4th daughter of Edward Mileham, of Burlingham Saint Peter. She bore him 12 children, and survived him three years. Throughout the civil wars he remained at heart a Royalist, and ever regretted what he called «the horrid murther of King Charles I.» But his calm spirit «quietly rested under the drums and tramplings» of the revolution, and he took no active part in the upheaval of the times.

Browne's reputation for learning and research was greatly increased in 1646 by the publication of his elaborate work, 'Pseudodoxia Epidemica: or, Enquiries into very many received tenets and commonly presumed truths, which examined prove but Vulgar and Common Errors.' This treatise is encyclopedic in scope, and must have grown to its final extent through many years of slow accretion. It was soon translated into Dutch, German and French; and attracted no little attention among scholars by the vast and recondite learning it displayed. Browne's advice and assistance soon became sought by scholars engaged in scientific and antiquarian pursuits. Among the best-known men of the time who sought his acquaintance was John Evelyn, with whom in 1658 he began a correspondence which lasted through his life. In October 1671, Evelyn journeyed to Norwich to visit Browne; and wrote, in his diary, an account of Browne's surroundings. The house and garden were «a paradise and cabinet of rarities, and that of the best collections, especially medals, books, plants and natural things.» Evelyn noticed particularly Browne's extensive collection of birds' eggs.

In 1658 Browne composed the solemn ‹Hydriotaphia, Urn-Burial; or, A Discourse of the Sepulchral Urns lately Found in Norfolk.› At the same time he published the most fantastic of his writings, ‹The Garden of Cyrus; or, The Quincuncial, Lozenge, or Network Plantations of the Ancients, Artificially, Naturally, Mystically Considered.› In December 1664, he was created socius honorarius of the College of Physicians, and received the diploma of the institution on 6 July 1665. On 28 Sept. 1671, he was knighted by Charles II, on the occasion of a royal visit to Norwich. Although Browne's literary activity continued unabated until his death, he published nothing after 1658. He died on his 77th birthday, and was buried in the church of Saint Peter Mancroft, Norwich. In 1840, some workmen who were making a new grave accidently fractured the lid of Browne's coffin with a pickaxe. The skeleton was thus exposed, and the sexton took possession of the skull. It is now on exhibition in the Norfolk and Norwich Hospital.

Many of Browne's manuscript writings were published posthumously. In 1684 his friend Archbishop Tenison brought out a collection of ‹Miscellany Tracts› on subjects ranging from the ancient monuments of Norwich to the plants mentioned in the Bible and the fishes eaten by our Saviour with his disciples after his resurrection from the dead. In 1690 his son, Dr. Edward Browne, published his beautiful ‹Letter to a Friend, upon occasion of the death of his intimate friend,› which forms a sort of prelude to the careful dissertation on ‹Christian Morals›— intended perhaps as a continuation of the ‹Religio Medici› — which was first published in 1716 by Archdeacon Jeffrey. A collection of the ‹Posthumous Works of the learned Sir Thomas Browne, Knt., M.D., late of Norwich,› was published by an unknown editor in 1712. It contains, among other tracts, a striking fragment of an essay on «Dreams.»

Browne belongs to the class of mystical soliloquists who love to discourse to themselves about fantastic subtleties too fine to excite the curiosity of vulgar minds, but who yet are not too self-engrossed to allow the friendly reader to overhear their musings. He loved to «turn the world round» not only for his own but also for his reader's «recreation,» and to lead the reader with him through a labyrinth of fancy until both «lose themselves in a mystery.» His works are lacking in design, uneven, whimsical and capricious; but they reveal a personality serene, altruistic, tolerant, mystical, reverent and friendly. Furthermore, he commands a style that for lordly eloquence and orchestral harmony remains unrivaled in the entire history of English prose.

Browne's greatest work is the ‹Religio Medici.› In this treatise, which combines the meditations of many leisure hours, he has revealed all of the emotional affluence of his soul. It is a mystical acceptance of the creed of the Anglican Church leavened with a touching tolerance of other beliefs. Paradoxically it combines an imaginative scepticsm with a naïve credulity. Browne believed in witches, for example; and refused to accept the Copernican system of astronomy because it contradicted the literal statements of the Hebrew Scriptures. But there is no narrowness in Browne's most characteristic mood. He rises on the wings of exaltation until he soars into the presence of Infinitude and glows with a religious ecstasy known of all nations and of all times.

The ‹Pseudodoxia› is a less worthy work. It is a vast chaos of recondite lore, bewildering by the very extent of its voluminous observation. It opens with an enquiry into the sources of error not a little resembling Bacon's famous arraignment of «Idols»; but Browne had no true sense of natural law as Bacon understood it, and often fallacies pursue him in his pursuit of fallacy.

‹The Garden of Cyrus› is a fanciful dissertation on the quincunx, that geometrical arrangement of five points familiar in the five of a domino. As Coleridge said, Browne finds «quincunxes in heaven above, quincunxes in earth below, quincunxes in the mind of man, quincunxes in tones, in optic nerves, in roots of trees, in leaves, in everything.»

The grandeur of Browne's style is displayed most fully in ‹Hydriotaphia.› Some Roman sepulchral urns accidentally unearthed in Norfolk furnished him with the suggestion for this eloquent monody, which, beginning with an historical discussion of ancient modes of burial, soon develops into a solemn homily on death and the vicissitudes of worldly fame. The style shows an eloquent spontaneity rather than a conscious mastery of art. It would not be a serviceable model for a modern writer; it is hyper-latinised and capricious; but it is incomparable for pompous rhythm and resonant harmony. See RELIGIO MEDICI; HYDRIOTAPHIA.

Bibliography.— The standard edition of Browne's works is that edited by Simon Wilkin (4 vols., 1835–36) which has been called the best edited book in the language; it contains a life of Dr. Johnson. The posthumous works (ed. 1712) contain also a life and Whitefoot's minutes. His ‹Notes and Letters,› edited by Southwell, were published in 1902. Consult also S. T. Coleridge, ‹Literary Remains›; Edward Dowden, ‹Puritan and Anglican Studies›; Edmund Gosse, ‹Sir Thomas Browne›; W. A. Greenhill, introductions (to separate volumes of Browne) ‹Golden Treasury Series›; Walter Pater, ‹Appreciations›; Sir Leslie Stephen, ‹Hours in a Library› (Vol. I); J. A. Symonds, introduction, ‹Camelot Series.›

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BROWNE, Thomas Alexander (ROLF BOLDREWOOD), Australian romancer: b. London, England, 6 Aug. 1826; d. Melboune, 11 March 1915. He is a son of Capt. Sylvester Browne, a founder of Melbourne, Australia. He was educated in Sydney College; was the author of 'Ups and Downs' (1879); 'Robbery Under Arms' (1888); 'A Squatter's Dream Story' (1890); 'The Miner's Right' (1890); 'A Colonial Reformer' (1890); 'A Sydney-Side Saxon' (1891); 'A Canvas Town Romance' (1898); 'The Babes in the Bush' (1900); 'In Bad Company' (1901); 'Ghost Camp' (1902); 'The Last Chance' (1905); 'A Tale of the Golden West' (1906).

BROWNE, Ulysses Maximilian (COUNT VON), Austrian military officer: b. Basel, 23 Oct. 1705, of an Irish Jacobite family: d. 26 June 1757. He entered the Austrian service at the age of 12, and after fighting against the Turks (1737–39), served in Silesia, and later became one of the foremost field-marshals in the army of Maria Theresa. As governor of Silesia (1739–42), he had to face the first of Frederick the Great's attacks, and in the Seven Years' War he commanded the Austrians at Lobositz (1756). He was mortally wounded at the battle of Prague.

BROWNE, William, English poet: b. Tavistock, Devonshire, 1591; d. Ottery Saint Mary, Devonshire, about 1643. He was educated at Oxford, and spent a quiet, tranquil life. His poetry is graceful and fanciful, and abounds in beautiful pictures of English scenery. Browne has always been much admired by the poets. His chief work is 'Britannia's Pastorals' (1613–16). 'The Shepherd's Pipe' (1614) is a collection of eclogues, and 'The Inner Temple Masque' (1614–15) tells the story of Ulysses and Circe. His minor poems are very fine. The best modern editions are by Hazlitt for the Roxburghe Club, and by Gordon Goodwin, 'The Muse's Library.'

BROWNE, William George, English traveler: b. London, 25 July 1768; d. northern Persia 1813. He was graduated from Oriel College, Oxford, after which he devoted himself to literary pursuits, and finally decided to explore central Africa. In several expeditions he traveled through Egypt and some parts of the interior of Africa, and through Asia Minor and Armenia. In 1793 he visited Sinai, and in May set out for Darfur, where he was detained by the Sultan, but finally released and allowed to return to London. In 1800, he again left England and spent three years in Greece, Asia Minor and Sicily. He had already, in 1813, arrived at Tabriz, on his way to Tartary, when his party was attacked by banditti and himself murdered. He was the author of 'Travels' in Africa, Egypt and Syria (1800). Robert Walpole published an account of Browne's journey through Asia Minor to Antioch and Cyprus from his papers in 'Memoirs relating to European and Asiatic Turkey' (1820).

BROWNE, William Hand, American author: b. Baltimore, 31 Dec. 1828; d. 13 Dec. 1912. He studied medicine and was graduated M.D. at the University of Maryland, but soon turned his attention to English literature, in certain departments of which he came to be an authority. He edited the *Southern Review* (1867–68), and the *Southern Magazine* (1870–75); he was librarian at Johns Hopkins University from 1879 to 1891, when he became professor of English literature. He translated F. Spielhagen's 'Hammer and Anvil' (1870); Turgenieff's 'Spring Floods' (1874); and Falke's 'Greece and Rome' (1882). In collaboration with R. M. Johnston he wrote 'Historical Sketch of English Literature' (1872); and a 'Life of Alexander H. Stephens' (1878); with J. T. Scharf, 'History of Maryland' (1878); and with S. S. Haldeman he compiled 'Clarendon Dictionary: Concise Hand-Book of the English Language' (1882). He has also written 'George Calvert and Cecilius Calvert, Barons Baltimore'; 'Maryland: the History of a Palatinate' (1884); and has edited 'Archives of Maryland: Proceedings and Acts of the General Assembly, 1637–44' (1883); and 'Selections from the Early Scottish Poets.'

BROWNELL, Clarence Ludlow, American journalist and educator: b. Hartford, Conn., 6 June 1864. He received his preparatory education at the Stamford Military Academy, made a special course at Harvard 1885–86, and received the degrees of M.A. and B.Sc. at the Stevens Institute of Technology. He went round the world soon after leaving the university, visited Brazil, South Africa, East Indies, the Philippines, China and Japan, Hawaiian Islands, British Columbia and Mexico. He was instructor in English and military drill in government and private schools in Japan for five years. Served on the staff of Seattle *Post-Intelligencer* and the New York *Press.* He contributed articles on Japanese topics to American and English magazines and newspapers. He did special work on Japanese history and Buddhism for the British Museum in 1903; was contributor to San Francisco *Chronicle,* Portland *Oregonian* and Los Angeles *Times* 1905–06; became headmaster of the Dayton Latin School in 1909; visited Cumberland Gap, Tenn., in 1909 and wrote series of articles on Lincoln Memorial University. He made a special study of educational conditions in the farming and manufacturing districts of western Ohio 1910–11; is now engaged in social service work at the Froebel School, Gary, Ind. He has published 'Tales from Tokio' (1900); 'Hon-Gwan-ji at Home and Abroad' (1902); 'The Heart of Japan' (1902); 'Japanese Wrestling' (1903); 'Japanese Archery' (1903); 'Japanese Swordsmen' (1903); 'Europe and America in Japan'; 'Japan in California' (1906).

BROWNELL, Franklin, Canadian artist: b. New Bedford, Mass., 28 July 1857. He makes specialties of portraits and figure-painting. For some years he has been principal of the Ottawa Art School. His canvas, 'The Photographer,' is in the National Gallery at Ottawa.

BROWNELL, George Griffin, American educator: b. Fairfield, N. Y., 2 July 1869. He was graduated at Syracuse University, 1893, studied at the Sorbonne, Paris, 1893–94, and at Johns Hopkins University, 1894–98, when he was appointed professor of Romance languages at the University of Alabama. He spent four years traveling in Africa, the Mediterranean countries and Mexico. Received the degree of Ph.D. from Johns Hopkins University in 1904. He is a corresponding member of the Hispanic

Society of America. Has edited for college use the Spansh texts ‘El Capitán Yeneno’ (1901); ‘El Pájaro Verde’ (1901); ‘La Vida de Vasco Nuñez de Balboa’ (1913). He published ‘The Position of the Attributive Adjective in Don Quixote’ (1910), and contributes regularly to periodical literature.

BROWNELL, Henry Howard, American poet and historian: b. Providence, R. I., 6 Feb. 1820; d. East Hartford, Conn., 31 Oct. 1872. He was graduated from Trinity College, Hartford, in 1841, studied law and was admitted to the bar, but settled as a teacher in Hartford. His first essay in poetry was a spirited versification of Farragut's ‘General Orders’ to the fleet below New Orleans. Afterward he was appointed to an honorary place on the *Hartford,* flagship, and had opportunity to observe actual naval warfare. In ‘The Bay Fight’ he describes, with truth and force, the battle of Mobile Bay. He collected and published his many occasional verses in ‘Lyrics of a Day; or, Newspaper Poetry by a Volunteer in the United States Service’ (1864). There is an appreciative essay on Brownwell by O. W. Holmes, entitled ‘Our Battle Laureate.’

BROWNELL, Thomas Church, American Protestant Episcopal bishop: b. Westport, Mass., 19 Oct. 1779; d. Hartford, Conn., 13 Jan. 1865. He was graduated from Union College, Schenectady, N. Y., in 1804. The next year he accepted the post of tutor in Latin and Greek in that institution; in 1807 was appointed to the chair of *belles-lettres* and moral philosophy; and in 1809 was chosen the first professor of chemistry and mineralogy. He entered the Episcopal ministry in 1816, and in connection with his professional duties gave himself to the work of a missionary in Schenectady. In 1818 he became an assistant minister in Trinity Church, New York. He was consecrated bishop of Connecticut, 27 Oct. 1819, and removed at once to his new field of labor. During his long episcopate of 45 years, Bishop Brownell was actively and efficiently engaged in the duties of his station at Kentucky, Mississippi, Louisiana and Alabama. Washington (now Trinity) College, at Hartford, Conn., took its rise under his auspices in 1824; and he became its first president, resigning in 1831. In 1852 he became presiding bishop in the American Episcopal Church. He published ‘The Family Prayer Book’ (1823); ‘Religion of the Heart and Life’ (1839–40); ‘Consolation for the Afflicted’; ‘The Christian's Walk and Conversation,’ etc. A bronze statue of Bishop Brownell has been placed on the campus of Trinity College.

BROWNELL, William Crary, American essayist and critic: b. New York, 30 Aug. 1851. Having graduated from Amherst, he devoted himself to critical and editorial work in New York city. He became an editor of *Scribner's Magazine,* and since 1888 he has been a literary adviser of Charles Scribner's Sons. His treatment of French life was recognized as remarkably subtle and sympathetic, and of French art as very suggestive from a non-professional standpoint. His studies of the later English prose writers have been highly praised. He was elected to the American Academy of Arts and Letters. Among his writings are ‘French Traits: an Essay on Comparative Criticism’ (1889); ‘French Art’ (1892); ‘Newport’ (1896); ‘Victorian Prose Masters’ (1901); ‘American Prose Masters’ (1909); ‘Criticism’ (1914).

BROWNIAN MOVEMENT (originally called BRUNONIAN MOTION or MOVEMENT), an irregular agitation seen when minute solid particles, suspended in a liquid, are viewed under a high magnifying power. The phenomenon is named for the Scottish botanist and agriculturist, Robert Brown (1773–1858), who observed it in 1827. It had been previously noted by Buffon and Spallanzani, but they did not comprehend its true nature, and thought that the moving particles which they saw were rudimentary animalcules. Brown had the advantage of improved achromatic microscope objectives. The Brownian movement is not to be confused with the tremor that results from vibration of the microscope stand, which affects all the particles in the visible field in the same manner, so that they execute their oscillations simultaneously and in parallel directions. Nor is it to be confused with such motions as may be produced by convection currents in the liquid in which the particles are suspended. Movements due to currents of this kind affect neighboring particles in the same way, whereas in the true Brownian movement the particles show wholly independent movement even when they are almost in contact with one another,— each pursuing its own course without the least relation to its neighbors. The movement is shown by particles of all kinds, and it has been observed in liquid carbonic acid in a cavity in the interior of a transparent quartz crystal, where it probably has been going on continuously for millions of years. It cannot be explained by any peculiarity of chemical composition, nor as a phenomenon dependent upon the gradual solution of the particles. Moreover, experiment shows that it does not depend upon light (as the motion of the radiometer does), because its activity is not modified by increasing the intensity of the light in the microscope field a thousand fold. It may be conveniently observed by examining, under a powerful microscope, water to which a very small amount of Chinese ink has been added.

Brown's discovery attracted no special attention at the time it was announced, and little is to be found with regard to it in scientific literature until 1888, when Gouy emphasized the inadequacy of the summary explanations of the phenomenon that had been offered previous to that time. Quite recently the subject has received exceedingly careful study from Prof. Jean Perrin of the Sorbonne, who gives the results of his investigations in his book ‘Les Atomes,’ and also in ‘The Brownian Movement and Molecular Reality’ (translated by Soddy). According to present views, which have been so completely verified by experiment that no important future modification is probable, the movement is due to the bombardment of the visible solid particles by the molecules of the liquid in which they are suspended. This bombardment is sensibly the same in all directions, if our observation extends over any considerable time; but on account of the nature of the molecular motion the balance cannot be perfect at every instant.

An extremely small suspended particle is therefore impelled hither and thither, as the force of the bombardment preponderates, momentarily, now on one side of it and now on another side; and the Brownian motion is the visible evidence of this action. Large suspended masses are subject to the same irregularity of pressure (or impact), but they do not show any sensible movement because the preponderance of the bombardment in any one direction is of too brief a duration to accelerate large masses to a measurable extent.

If the Brownian movement is caused as here described, much may evidently be learned from it with regard to molecular physics; because microscopic solid particles will behave in many respects like molecules of enormous size; and their behavior and distribution in the liquid in which they float will conform, very closely, with the laws which govern the interdiffusion of the molecules of liquids.

In his methodical study of the subject, Perrin undertook to make emulsions containing minute solid particles of spherical shape and uniform size. For this purpose he dissolved resinous substances in alcohol, and subsequently precipitated them as emulsions by pouring their alcoholic solutions into considerable quantities of water. Of the 11 different resins tried, two (namely, mastic and gum gamboge) gave excellent results. To secure uniformity of size in the spherules he subjected the emulsions to powerful centrifugal action for a long time, thereby effectively separating the larger particles from the smaller ones. The work was tedious, but after several months of labor he obtained, from a kilogram of gum gamboge, a satisfactory emulsion containing several decigrams of the gum in the form of suspended spherules of remarkably uniform size and sphericity. Consonant determinations of the density of these spherules were obtained by three methods,— one of which consisted in dissolving bromide of potassium in the emulsion until the centrifugal machine no longer affected the spherules, and then determining the density of the solution. To ascertain the diameters of the particles three methods were also used. One of these consisted in allowing a single layer of spherules to settle in contact with one another on the surface of a microscope slide, and then counting the number of spherules included within a known length or covering a known area.

From a study of the way in which the density of distribution of the spherules in his standard emulsions varied with height when a state of equilibrium was attained, Perrin draws important conclusions concerning the relation between the masses of his resin spherules and the masses of actual molecules; and as he had already determined the average mass of the spherules, he is therefore able to calculate the mass of an actual molecule. In this way he finds that 682 thousand million million million hydrogen atoms would have a combined mass of one gram. See GASES, MOLECULAR THEORY OF; and MOLECULAR THEORY.

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BROWNIE, a spirit or goblin, in old popular superstitions of Scotland, supposed to haunt old houses, especially those attached to farms. He might be called the Robin Goodfellow of Scotland. In the night he helped the family, and particularly the servants, by doing many pieces of drudgery, performing domestic labors while the inmates of the household slept. If offered food or any other recompense for his services, he decamped and was seen no more. In Germany, he is called «Kobold,» and the old Roman «Lar» is akin to him.

BROWNING, Elizabeth Barrett, English poet: b. Coxhoe Hall, Durham, 6 March 1806; d. Florence, Italy, 30 June 1861. Her father, Edward Moulton, or Moulton-Barrett, as soon after her birth he began to write his name, was a country gentleman who resided at the foot of the Malvern Hills, and in this beautiful retreat Elizabeth's girlhood was passed. She early began to commit her thoughts to writing, and in 1826 appeared her volume entitled 'An Essay on Mind and Other Poems,' anonymously published. Viewed as the production of a young woman of 20, this book is indeed a remarkable one; but in after years its author was so dissatisfied with it that she omitted it in the collected editions of her poems. In 1833 appeared a translation by her of the 'Prometheus Bound' of Æschylus. A collection entitled 'The Seraphim and Other Poems' was produced in 1838, the principal piece being a lyric drama shadowing forth the feelings and emotions which may be supposed to have been excited in an angelic being by the spectacle of the crucifixion. Both in this and in a subsequent work, 'The Drama of Exile' (1840), she chose for her theme the fall and redemption of man, subjects on which Milton had already employed his genius, and in the treatment of which, though exhibiting much grandeur and sublimity, Mrs. Browning can scarcely be said to have approached him. Always feeble in health, she was now nearly brought to the verge of the grave by the rupture of a blood vessel, and having been taken to Devonshire to promote her recovery, received there a severe shock from the drowning of a favorite brother. For several years she was confined to a darkened chamber, and saw only a few of her most intimate friends, but nevertheless continued to busy herself with study and composition. Her health was at length partially restored and in 1846 she was married to Robert Browning, already well known in the literary world as a poet and dramatist. After their union they went to Italy, and continued subsequently to reside for the most part in Florence. In 1850 a collected edition of Mrs. Browning's works appeared in two volumes, including several new poems, and among others 'Lady Geraldine's Courtship,' one of the finest of her productions, and remarkable, it is said, as having been composed in the incredibly short space of 12 hours. Her 'Sonnets from the Portuguese,' included in this volume, were written after her engagement, and first privately printed. They have no parallel for excellence in their peculiar kind in our literature. 'Casa Guidi Windows,' a poem on the struggles of the Italians for liberty in 1848–49, appeared in 1851. The longest and most finished of all her works, 'Aurora Leigh,' a romantic narrative and didactic poem in blank verse, was published in 1857. Her last volume, 'Poems Before Congress,' appeared in 1860, and cannot be said to have added greatly to her reputation. Several detached pieces of hers appeared from time to time in the *Cornhill Magazine*, up to the period of her death. ‘Last Poems,’ by Mrs. Browning, published by Robert Browning in 1862, and ‘Greek Christian Poets and the English Poets,’ translations and essays of hers published by Browning in 1863, were followed in 1866 by his publication of ‘Selections from the Poems of Elizabeth Barrett Browning’ (2d series, 1880). The ‘Letters of E. B. Browning,’ edited by Frederick G. Kenyon (1897), are a definitive presentation of her character and career in a selection from a very large mass of correspondence collected by Mr. Browning himself. It is a chronicle, and practically a life, by reason of the character of the letters and the addition of connecting links of narrative. The letters give an unusually full and interesting revelation of the course of her life. Mrs. Browning's poetry is characterized by much pathos and depth of feeling, combined with great vividness and powers of description. It partakes eminently of the modern English school, as represented by Tennyson and others, at times obscure and transcendental, but animated throughout by the most noble and exalted sentiments, and illuminated from time to time by flashes which, in their bearings on the unseen world of mind and spirit, seem almost supernatural. She is described by George Macdonald as «the princess of poets,» in idea noble, in phrase magnificent. In their married life she and Robert Browning found mutual happiness and help, the good influences of which are reciprocally manifested in their writings. See AURORA LEIGH; SONNETS FROM THE PORTUGUESE.

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BROWNING, Orville Hickman, American politican: b. Harrison County, Ky., 1810; d. Quincy, Ill., 10 Aug. 1881. While performing the duties of clerk in the office of the county and circuit clerk of Bracken County, he pursued a course of classical studies at Augusta College. Admitted to the bar in 1831, he settled in practice at Quincy, Ill., where he subsequently resided. In 1832 he served through the Black Hawk War, and was a member of the Illinois legislature, 1836–43. In conjunction with Abraham Lincoln he organized the Republican party in Illinois at the Bloomington convention. When the Civil War broke out he warmly supported the government, and in 1861 was appointed to the United States Senate to fill the vacancy caused by the resignation of Stephen A. Douglas. President Johnson made him Secretary of the Interior in 1866, and for one year from March 1868 he also acted as Attorney-General. In 1869 he was elected to the State Constitutional Convention, and after that he retired to the practice of his profession.

BROWNING, Oscar, English author: b. London, 17 Jan. 1837. He was educated at Eton and at King's College, Cambridge, where he was graduated in 1860. He has served as a master at Eton, as lecturer in history and political science at Cambridge and as principal of the University Training College for Teachers. He is a voluminous writer on subjects of education, history, biography, etc., and among his works are ‘Modern England’ (1879); ‘Modern France’ (1880); ‘History of Educational Theories’ (1881); ‘History of England’ (1890); ‘Life of George Eliot’ (1890); ‘The Citizen: His Rights and Responsibilities’ (1893); ‘Wars of the 19th Century’ (1899); ‘History of Europe 1814–43’ (1901); ‘Letters from India’ (1902); ‘Napoleon: the First Phase’ (1906); ‘The Fall of Napoleon’ (1907); ‘Memories of Sixty Years’ (1910); ‘History of the Modern World’ (1912) ‘General History of Italy’ (1915).

BROWNING, Robert, English poet: b. Camberwell, a suburb of London, 7 May 1812; d. Venice, 12 Dec. 1889. His father, Robert who was a clerk in the Bank of England, and was himself a lover of books, a classical scholar and ready at versifying, had the boy educated in a school at Peckham, after which he attended lectures at University College. His father's family being Dissenters, his mind was trained and his character formed under influences less peculiarly English than those to which youths are exposed in the great public schools and the two leading universities of that country. At the age of 20 he traveled on the Continent and resided for some time in Italy, where he made diligent study of the mediæval history of that country, so fruitful in themes for poetry such as his genius was to produce. In 1833 he published anonymously his first book, ‘Pauline’; spent some months in Russia, in 1834; and in the following year issued ‘Paracelsus,’ a dramatic poem in five parts. In 1837, at the suggestion of Macready, he wrote the tragedy of ‘Strafford,’ which was produced at Covent Garden in May of the same year, with no marked success. His next poem, ‘Sordello,’ was printed in 1840, and the obscurity of its introspective subtleties injured the poet's reputation with the critics. Notwithstanding this, he published (1841–46) the ‘Bells and Pomegranates’ series, in which were included the three plays, ‘Pippa Passes,’ ‘King Victor and King Charles’ and ‘Colombe's Birthday’; the four tragedies, ‘The Return of the Druses,’ ‘A Blot in the 'Scutcheon’ (produced by Macready at Drury Lane in 1843), ‘Luria’ and ‘A Soul's Tragedy’; while among the lyrics were ‘The Pied Piper of Hamelin,’ ‘How They Brought the Good News from Ghent to Aix’ and ‘The Lost Leader.’ In 1846 he married Elizabeth Barrett, and settled with her in Florence, where they remained for nearly 15 years. During his residence there he published ‘Christmas Eve and Easter Day’ (1850), and ‘Men and Women’ (1855), the latter containing such characteristic poems as ‘Andrea del Sarto,’ ‘Fra Lippo,’ ‘Childe Roland,’ ‘Evelyn Hope,’ ‘One Word More’ and ‘Up at a Villa.’ After the death of his wife in 1861 Browning returned to London, and there entered upon his richest literary period by publishing ‘Dramatis Personæ’ (1864). These dramatic monologues, of which there were 17, include ‘Rabbi Ben Ezra,’ ‘Abt Vogler,’ ‘Prospice,' 'Caliban upon Setebos' and 'A Death in the Desert.' Recognition of his literary fame, which came slowly, was made in 1867, when he was elected an honorary fellow of Balliol, an M.A. of Oxford, and later an LL.D. of Cambridge. It was not, however, until 1869, that 'The Ring and the Book' was published, and this poem, which accentuates every characteristic of the poet, still remains his central achievement. The poem, which is epical in length if not in method, is the story of a murder told 10 times over in wide variety of intention by various persons connected with the tragedy. His next publication was the short poem of 'Hervé Riel,' the proceeds from which were devoted to the relief of Paris after the siege in 1871. Following this came 'Balaustion's Adventure' (1871), including a translation of Euripides' 'Alcestis'; 'Prince Hohenstiel-Schwangau, 'Saviour of Society' (1871), an imaginary conception of how Louis Napoleon might justify his policy; 'Fifine at the Fair' (1872), in which the relations of the sexes are discussed; 'Red-Cotton Night-Cap Country' (1873), a story of love, penitence and suicide, the scene of which is laid in Normandy; 'Aristophanes' Apology' (1875); 'The Inn Album' (1875), a story of a woman's wrongs; 'Pacchiarotto and Other Poems' (1876), in which 'Pacchiarotto and How He Worked in Distemper' conveys an implication of Browning's own method in the poetic art; 'The Agamemnon of Æschylus' (1877); and 'La Saisiaz' (1878), in which immortality is discussed. As a kind of new departure he published a first set of 'Dramatic Idylls' (1879), and a second series (1880), of which the more important are 'Martin Relph,' 'Pheidippides' and 'Ivan Ivanovitch.' The volumes which have followed are 'Jocoseria' (1883); 'Ferishtah's Fancies' (1884); 'Parleyings with Certain People of Importance in Their Day' (1887), and 'Asolando' (1889). The latter volume was published when the author was on his death-bed, and an account of its favorable reception was almost the last information he received. In national recognition of his genius, he was buried in Westminster Abbey between Cowley and Chaucer.

In such fashion, and in ungrudged completeness, was his poetic greatness acknowledged at the last. Its too tardy recognition by the popular voice was largely due to the prevailing belief that poetry is for the mental dalliance of a lazy hour, and also to the persistency with which Browning had mocked at this belief in the athletic hardiness of mind which he required in his readers. Moreover he seemed always inclined, to the dismay of the public, to press forward into service the superficial defects of his solid interior qualities. Thus, at times, his wide scholarship strayed off into pedantry; his secure skill in verse dropped ever and again into grotesque Bohemian robustness of phrase and rhyme; his swift intuitive glance into the problems of life seemed to create in him an artistic impatience of detail which, in the structure of his verse, became a thrifty brusqueness of expression tending toward cipher; and, above all, his most notable gift of analysis, his power to track the most hidden motive to its last retreat, seemed ever tending to lapse into an introspective subtlety akin to the cobwebberies of the schoolmen. Yet, aside from these occasional shortcomings, there remain his learning, his humor, his mastery of artistic expression, his immense range of sympathy, his spiritual insight and the height and strength of his ideals to make him one of the greatest of modern poets. See SORDELLO; PIPPA PASSES; RING AND THE BOOK, THE; SAUL; CHILDE ROLAND TO THE DARK TOWER CAME; PIED PIPER OF HAMELIN, THE; ANDREA DEL SARTO; FRA LIPPO LIPPI.

Bibliography.— The poems of Robert Browning have given rise to a great body of literature, largely interpretative. His 'Life' and Letters,' edited by Mrs. Sutherland Orr, was published in 1891; the 'Love Letters, 1845–46,' in 1899. Among biographies and appreciations may be recommended those by G. H. Chesterton (1908); Edward Dowden (London 1905); R. B. Figgis (London 1902); C. H. Herford (New York 1905), and R. B. Waugh (London 1900). Other useful works are Berdoe, E., 'Browning Cyclopedia' (London 1892); 'Studies' (London 1895); Brooke, Stopford, 'Poetry of Robert Browning' (London 1902); Clarke, 'Browning and His Century' (New York 1912); Cunliffe, 'Elizabeth Barrett Browning's Influence on Robert Browning's Poetry' (Cambridge 1908); Gosse, E., 'Personalia' (London 1890); Jones, H., 'Browning as a Philosophical and Religious Teacher' (6th ed., 1913); Nettleship, 'Robert Browning: Essays and Thoughts' (London 1890); Phelps, 'Robert Browning: How to Know Him' (New York 1915); Pigou, A. C., 'Robert Browning as a Religious Teacher' (London 1901); Revell, W. F., 'Browning's Criticism of Life' (London 1892); Symons, Arthur, 'Introduction to the Study of Robert Browning' (London 1886), and the publications of the Browning Society.

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BROWNING GUN. See MACHINE GUN.

BROWNISM. See BROWNE, ROBERT.

BROWNISTS, a name given during the latter part of the 16th century to those who were afterward known in England and Holland under the denomination of Independents, called Brownists from Robert Browne (q.v.). See also CONGREGATIONALISTS.

BROWNLEE, William Craig, American clergyman: b. Torfoot, Lanarkshire, Scotland, 1784; d. New York, 10 Feb. 1860. His paternal ancestors for many generations were the "Lairds of Torfoot." He was graduated M.A. at the University of Glasgow, was licensed to preach and came to America in 1808. For a time he taught Latin and Greek in Rutgers College, but in 1826 was installed as one of the ministers of the Collegiate Reformed Dutch Church in New York city. He was a vigorous controversialist, earnestly opposing the Quakers and Roman Catholics. His writings include 'Inquiry into the Principles of the Quakers' (1824); 'The Roman Catholic Controversy' (1834); 'Treatise on Popery' (1847); 'Lights and Shadows of Christian Life' (1847); 'Deity of Christ,' 'History of the Western Apostolic Church,' and some minor religious tracts and pamphlets.

BROWNLOW, William Gannaway, American clergyman, journalist and politician: b. Wythe County, Va., 29 Aug. 1805; d. Knoxville, Tenn., 29 April 1877. Early left an orphan and penniless, he earned enough as a carpenter to give himself a fair education, and in 1826 became an itinerant Methodist preacher. He began his career as a political agitator in 1828 by advocating in Tennessee the re-election of President John Quincy Adams, and in Calhoun's own district in South Carolina he publicly opposed nullification. From 1838 until its suppression by the Confederates in 1861, he published and edited at Knoxville a paper called *The Whig,* his fiery editorials causing him to become known as «the fighting parson.» He upheld slavery but opposed secession, a course which subjected him to much persecution. He refused to take the Confederate oath of allegiance, and in consequence was imprisoned on a charge of treason, but finally released and sent into the Union lines, 3 March 1862. On the reconstruction of Tennessee in 1865 he was elected governor and served two terms. He advocated the removal of the negroes to a separate territory and opposed giving them the ballot. In 1869 he was elected to the United States Senate and served until 1875, during which time he was a member of the committees on pensions and revolutionary claims. He wrote 'The Great Iron Wheel Examined' (1858), a defense of Methodism; 'Sketches of the Rise, Progress and Decline of Secession: With a Narrative of Personal Adventures Among the Rebels' (1862); and, with Prynne, 'Ought American Slavery to be Perpetuated? A Debate at Philadelphia, September 1858,' in which Brownlow took the affirmative side (1858).

BROWNSON, Orestes A., American publicist: b. Stockbridge, Vt., 1803; d. 1876. His writings embrace philosophical, political, sociological and theological subjects. He was brought up without any strictly defined creed, but at the age of 19 formally joined the Presbyterian Church. Soon becoming dissatisfied with Presbyterianism he sought refuge in Universalism, abandoning, as he himself says, Supernaturalism for Rationalism. After leaving Presbyterianism, in 1825, he applied for and received a letter of fellowship as a preacher from the General Convention of Universalists. It was shortly after this that he fell in with the socialistic theories of Robert Owen, who had come to this country to establish his communistic colony at New Harmony, Ind. Under the influence of Owen's ideas, Brownson coöperated in founding and establishing the Workingman's party to advance Socialism in the sphere of practical politics. Through Owen Dr. Brownson also came in contact with Frances Wright, who lectured throughout the United States in the interest of the Socialist propaganda. But Brownson's enthusiasm in the political side of the question was short-lived and he soon abandoned the political movement and returned to his pulpit, but as an independent preacher, responsible to no church, sect or denomination. In 1832 he came under the influence of Dr. Channing, to whom he pays a grateful but discriminating tribute in his work 'The Convert,' written after his conversion to the Catholic Church. In 1836 he went to Boston to preach to the laboring classes, and becoming convinced of «the necessity of a new religious organization of mankind,» established for that purpose «The Society for Christian Union Progress,» whose object was the union and progress of mankind on broad humanitarian lines. The «new doctrine» inculcated and preached during this period by Dr. Brownson was a mixture, in part drawn from the Eclecticism of Cousin and from the Communism of the Saint-Simonians, a philosophico-religious sect then recently sprung up in France. Brownson's attitude was at this time ultra-radical; he utterly denied the Church and the priesthood in the religious order, and the distinction of classes in the social order, and would have made all government but the instrument to level men and their institutions to the lowest terms of the socialistic idea. But by 1840 he began to retrace his steps, and after much study and reflection, and after having read for the first time, as he himself tells us in 'The Convert,' Aristotle on Politics, «came to see that the condition of liberty is order, and that in this world we must seek not equality, but justice.» Up to this point in his career Dr. Brownson had followed negative lines in his religious and intellectual life from a belief in a supernatural Christianity, as represented by Presbyterianism, to the broadest Socialism which denied the supernatural life of man altogether. He now began an advance to a positive and supernatural conception of the world. «I had now settled in my mind,» he says, «that the progress of man and society is effected only by supernatural assistance, and that this assistance is rendered by Almighty God, in perfect accordance with nature and reason, through providential means.» With this conception as his premise, after some four years of struggle and study, he arrived at the conclusion that he must logically accept the Catholic Church as the divinely established institution for the supernatural guidance and direction of mankind. After receiving instruction from Bishop Fitzpatrick, of Boston, Dr. Brownson was baptized a Catholic in 1844, and died in the Catholic communion. After his entrance into the Catholic Church he became its ardent and vigorous champion, though sometimes in the advocacy of his views he came into conflict with ecclesiastical authority. He was a vigorous and trenchant writer, bold and uncompromising in his views, when he believed them logical, and often in controversy unsparing in his method against an adversary. His temperament was polemical and fearless, his interest keen and his advocacy enthusiastic of whatsoever cause he might be pleading. He was a sincere lover of truth and unflinching in pursuing his conclusions. He was perhaps the greatest publicist whom America has produced. His writings are voluminous, covering a vast variety of subjects, and have been published in 20 volumes (1882–87) by his son, Henry F. Brownson. A 'Life' in three volumes by the latter appeared in 1900. 'Watchwords from Dr. Brownson' was edited by J. S. O'Neil (1910).

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BROWNSTONE, the reddish-brown sandstone of the Triassic Age, so named originally in the eastern United States, where it occurs in New Jersey and Connecticut. The name is now generally used for any brown sandstone adapted for building purposes, but the most important stones included under this name are those which are quarried at Portland and Middletown, Conn., and the Cambrian or Pre-Cambrian sandstones that are worked near Marquette, Mich. The use of brownstone has greatly diminished in recent years, granite and limestone having largely superseded it in public favor.

BROWNSTOWN, Battle of. See DETROIT, SIEGE AND CAPTURE OF.

BROWNSVILLE, Tenn., city and county-seat of Haywood County, 55 miles northeast of Memphis, on the Louisville and Nashville Railroad. Fruit growing, lumbering, stock raising and cotton growing are the city's chief interests. It has a large trade in these and contains a cotton compress, cottonseed-oil mill, etc. It has also a Carnegie library and is the seat of Brownsville Training School for Boys. The city owns the waterworks. Pop. 3,062.

BROWNSVILLE, Tex., city, port of entry and county-seat of Cameron County, situated on the Rio Grande River and the Rio Grande Railroad opposite Matamoras, Mexico. It contains the cathedral of the Immaculate Conception, the Convent and Academy of the Incarnate Word, a United States government building and a national bank, and has a large trade with Mexico. The products of farming and stock raising constitute a considerable part of the city's trade. There is also a large sugar mill. Nearby, at Point Isabel, the government has erected a large wireless station. In the suburbs is Fort Brown, a garrisoned United States post. In May 1846 Brownsville was occupied and fortified by a small body of United States troops, who maintained their position in the face of a heavy bombardment that lasted for 160 hours, and the town was taken by Mexican raiders under Cortina on 28 Sept. 1859. In November 1863 it was taken from the Confederates by a Federal army under General Banks. On the night of 13 Aug. 1906, a shooting affray occurred which was attributed to a negro regiment at Fort Brown. Failing to detect the particular offenders, President Roosevelt dismissed an entire battalion, which action occasioned heated debates in Congress and in the public press. The city has adopted the commission-manager plan of government. Pop. 11,791.

BROWNWOOD, Tex., a city and county-seat of Brown County, situated on the Gulf, C. & S. F. and the Fort Worth & R. G. railways, 140 miles northwest from Austin. It was settled in 1866 and incorporated in 1878. It trades in wheat, hay, cotton, cattle, hides and pecan nuts. There are flour mills, cottonseed-oil mills and manufactories of wire-fencing, saddle and harness, ice, etc. Here are located the Daniel Baker College, under Presbyterian auspices, and the Howard Payne College, controlled by the Baptists. The city owns its waterworks and has a Carnegie library. Pop. (1920) 8,223.

BROZIK, brō-jēk, **Vaczlav,** Bohemian artist: b. near Pilsen 1852; d. 1901. He was a pupil at the Prague Academy, where he studied under Emil Lauffers, and also of Piloty in Munich and Bonnat in Paris. Most of his subjects were taken from the history of Bohemia, and as a historical painter he won high rank. His canvases are usually very large and crowded and are interesting chiefly as illustrations. Among his works may be mentioned the 'Embassy of Ladislas of Bohemia to Charles VII of France'; 'The Execution on the White Mountain'; 'The Ballad Singer' and 'The Imperial Councilors Thrown Out of the Window at Prague.' His 'Columbus at the Court of Ferdinand and Isabella' is in the Metropolitan Museum, New York.

BRUCE, a noble family of Scotland, two members of which occupied the throne after one had pretended to it in vain. Distinguished members were:

1. ROBERT, 7th lord of Annandale: b. 1210; d. 1 April 1295. He was one of the 13 claimants of the crown in 1290, when, by the demise of Margaret, the "Maiden of Norway," the posterity of the last three kings of Scotland had become extinct, and the succession reverted to the posterity of David, Earl of Huntington, and younger brother of King William, the Lion. The question of succession speedily resolved itself into a simple alternative between two competitors, John Baliol, the great-grandson of David by his eldest daughter, Margaret, and Robert Bruce, the grandson of David by his second daughter, Isabel. The contest was, by mutual consent, referred for decision to King Edward I of England, who pronounced, in accordance with principles that would not now be disputed, that "in all indivisible heritages the more remote in degree of the first line of descent is preferable to the nearer in degree of the second," and thus gave the kingdom to Baliol, from whom he required homage and fealty. Bruce now retired to England, took service in the English army and fought against Baliol in the war which resulted in the subjugation of Scotland to England. He returned to his English estates soon after the resignation of Baliol where he died.

2. ROBERT, son of the preceding, Earl of Carrick and Annandale: d. 1304. He constantly followed the fortunes of Edward and fought bravely against Wallace and the patriot party of Scotland. After having assisted in defeating Wallace at Falkirk, he is said to have slackened his zeal for England, but did so little for the national cause that he was able to make his peace with Edward, when, a little later, after the capitulation at Irvine, Wallace was driven with his adherents into the northern mountains.

3. ROBERT, son of the preceding, Earl of Carrick, and afterward King of Scotland: b. 21 March 1274; d. 9 July 1329. He acted at first as Edward's liegeman, but vacillated between the two parties, taking no very active part in the struggle between Wallace and England, but inclining to the national cause when a gleam of success enlivened the hopes of the patriots, and, at the approach of Edward, making his peace with the conqueror. He was one of those consulted by the King in the settlement of Scotland as an English province, and was permitted to retain the extensive lands of his ancestors unalienated. In 1306, Comyn, the son of Baliol's sister, a nobleman distinguished by his efforts to recover the independence of his country, arrived in Dumfries about the same time with Bruce. By appointment he met Bruce alone in the church of the Minorites, who there stabbed him with his dagger; whether by premeditated treachery or in a sudden fit of passion

cannot now be ascertained. Bruce now assumed the title of King, summoned the Scots to his standard, and was crowned, without any opposition, at Scone. Edward immediately sent Aymar de Valence, Earl of Pembroke, with a great army to chastise the rebels. The force of Bruce was almost immediately destroyed, six of his best knights made prisoners, and he himself, thrown from his horse, was rescued only by the devotion of Seaton. For two months, with his brothers and the ladies of his household, he wandered to and fro in the Grampian Hills, till, his party being discovered, defeated and forced to separate, he buried himself for concealment in the island of Rathlin, on the north of Ireland. His three brothers and others were captured, and the brothers were soon after hanged at Carlisle. In the spring of 1307 Bruce returned from his retreat, surprised his own castle of Carrick, defeated small parties of English in many skirmishes and was enabled to maintain himself among the hills and forests until Edward called out an army and marched toward the borders, but died on his way, leaving to his son a charge not to bury his bones till he had borne them in triumph from Berwick bounds to the utmost highlands. For three years Edward II paid no attention to his father's advice or the Scottish war, but in the autumn of 1310 he marched into Scotland as far as the Forth without encountering an enemy, for Bruce wisely declined to give him battle. In the next year he sent his favorite Gaveston to renew the war, who penetrated beyond the Forth but still gained no advantage, Bruce constantly retreating before him, keeping the hills, where he could not be assailed, and harassing the English by constant petty skirmishes in which he mostly worsted them. The following years were passed by Edward in ignoble contentions with his Parliament, and by Bruce in gradually but surely recovering all that he had lost in Scotland, until, in 1314, the strong hill fortress of Stirling alone held out for the English, and even that the governor, Mowbray, had been forced to consent to surrender if it should not be relieved before the feast of Saint John the Baptist. This at length aroused Edward, who, at the head of a large army, encamped in the neighborhood of the beleaguered fortress, and was there met by Bruce at the head of 30,000 picked men, on the eve of the festival fixed for its surrender. The battle of Bannockburn, which succeeded, was the bloodiest defeat which the English ever suffered at the hands of their Scottish neighbors. It fixed the crown securely on the head of Bruce and at once enabled him to exchange his prisoners, who were of the highest rank in England, against his wife, his sister and his other relatives, who had long languished in captivity. After this success the Scottish people assumed the offensive and invaded Ireland, where they at first gained considerable successes, and of which island Edward Bruce was crowned King. While the dissensions lasted between Edward II and his barons, Robert Bruce repeatedly devastated the borders and all the north of Yorkshire, even to the walls of York, into which he on one occasion chased the English King in disgrace, narrowly failing to make him prisoner. In 1323 this bloody war, which had raged, with few pauses, for 23 years, was brought to a close by a truce concluded between the two kingdoms for 13 years, to remain in force even in the event of the death of one or both of the contracting parties. Four years after this Edward II was compelled to abdicate in favor of his son, Edward III, and Bruce, seeing his occasion in the distracted state of England, renewed the war, with the avowed intention of forcing Edward to renounce his claim of sovereignty over the crown of Scotland. In 1328 this renunciation was made; Scotland was declared sovereign and independent; Jane of England, the sister of Edward, was affianced to David, Prince of Scotland, and Robert Bruce paid £20,000 sterling to defray the expenses of the war. He died the next year, having, after a life of incessant toil and warfare, secured the independence of his country and won the crown, which he left undisputed to his son.

4. Edward: d. 1318. He was a brother of Robert I of Scotland, who, after distinguishing himself in the Scottish war of independence, crossed in 1315 to Ireland to aid the native septs against the English. After many successes he was crowned King of Ireland at Carrickfergus, but fell in battle near Dundalk.

5. David, son of the preceding king of Scotland: b. about 1320; d. 22 Feb. 1371. Shortly after his accession, at the age of nine years, his kingdom was invaded and his crown wrested from him by Edward Baliol, son of that John Baliol whom Edward I had compelled to resign the crown. In support of his claim Edward III maintained a fierce strife on the borders, in active though undeclared hostilities to the Scots. David, with his young queen, Jane of England, escaped to France, where he resided till 1341, when, the nobles Murray, Douglas and Stuart having expelled Baliol from the throne into the northern counties of England, he ventured to return. In 1346, while Edward III, with the flower of his army, was absent in France, David suddenly invaded England at the head of 33,000 men. He was met at Neville's Cross, Durham, by a force of 11,200 irregular troops under Queen Philippa. The Scottish troops were totally defeated, leaving 15,000 men dead on the field of battle and their King a prisoner. From this time until 1357 David was detained a prisoner in the Tower of London, when he was liberated after the battle of Poitiers, on agreeing to pay 100,000 marks in 20 half-yearly instalments. His queen, Jane of England, died in 1362 and David then married Margaret Logie, whom he divorced in 1369. He tried to exclude his nephew, Robert, from the throne, and died at Edinburgh Castle 22 Feb. 1371. Consult Dunbar, ‹Scottish Kings› (Edinburgh 1906).

BRUCE, Alexander Balmain, Scottish theologian: b. Abernethy, Perthshire, 1831; d. Glasgow, 7 Aug. 1899. He was ordained to the ministry of the Free Church of Scotland, held pastorates at Cardross and Broughty Ferry, and was elected professor of apologetics and New Testament exegesis in the divinity hall at Glasgow in 1875. He established a high reputation as an exegetical writer, and exercised a profound influence over the minds of his students. The publication in 1889 of ‹The Kingdom of God; or Christ's Teaching in the Synoptic Gospels› involved him the following year in a charge of heresy before the General

Assembly, which ended in acquittal. His works include 'The Training of the Twelve' (1871); 'The Humiliation of Christ' (1876); 'The Parabolic Teaching of Christ' (1882); 'Commentary on the Synoptic Gospels' (1897); the Gifford Lectures, 'The Providential Order of the World' (1897); 'The Moral Order of the World' (1899); and 'With Open Face' (1896).

BRUCE, Blanche Kelso, American colored politician: b. Prince Edward County, Va., 1841; d. 1898. Born in slavery but educated with the son of his master, and subsequently a student at Oberlin College, he became a planter in Mississippi in 1869. Entering politics he became a United States senator from Mississippi in 1875, the first negro member of the National Senate. He was appointed register of the United States Treasury in 1881, holding office till 1885, and was reappointed to the same office by President McKinley in 1897.

BRUCE, Sir **David,** English surgeon: b. Melbourne, Australia, 29 May 1855. He was graduated at Edinburgh University, entered the Royal Army Medical Corps in 1883, has served in Malta, Egypt and South Africa (including siege of Ladysmith), and holds rank as surgeon-general. He is an authority on tropical diseases, and has been director of the following official investigations: (1) on sleeping sickness, in Uganda, 1903, and 1908–10; (2) on Mediterranean fever, at Malta, 1904–06; (3) on the connection between wild animals and human and stock diseases, in Nyassaland, 1911–14. He was knighted in 1908.

BRUCE, Herbert Alexander, Canadian surgeon: b. Blackstock County, Durham, Ontario, 28 Sept. 1868. He was graduated M.D. at Toronto University in 1892, and is a licentiate of the Royal College of Physicians of London and a fellow of the Royal College of Surgeons of England. He was appointed associate professor of clinical surgery at Toronto University in 1907, and in 1909 became head of the service in surgery at Toronto General Hospital. He was president of the Ontario Medical Association in 1911–12. He was attached to the Canadian Army Medical Corps in 1915, in which he holds rank as lieutenant-colonel. His report on the condition of the Canadian army hospitals overseas, prepared at the request of the Minister of Militia, Sir Sam Hughes, in which he strongly animadverted on the condition of the Canadian hospitals in England, was the occasion of a somewhat heated controversy. He is the author of numerous pamphlets on medical subjects.

BRUCE, James, Scottish traveler: b. Kinnaird House, Stirlingshire, 14 Dec. 1730; d. there, 27 April 1794. He became a wine merchant in 1754, but on the death of his wife he took up the study of languages, and availed himself of the opportunities of his trade to visit Spain, Portugal and the Netherlands. In 1758 he inherited his father's estate, and he consequently retired from the wine trade in 1761. Lord Halifax, appreciating Bruce's character, proposed to him a tour of discovery, in which he promised him his protection and support. He pointed specially to the exploration of the coast of Barbary, in completion of the labors of Shaw, and hinted also at the discovery of the sources of the Nile. In the meantime Halifax offered him the consulship of Algiers, which was accepted. His consulship lasted for two years, and on its expiration in 1765 he visited successively Tunis, Tripoli, Rhodes, Cyprus, Syria and several parts of Asia Minor, where, accompanied by an able Italian draughtsman, he made drawings of the ruins of Palmyra, Baalbec and other remains of antiquity. Having now formed his plan for visiting Abyssinia, he set out for Cairo in June 1768, after about a year spent in Syria, navigated the Nile to Syene, crossed the desert to the Red Sea, passed some months in Arabia Felix, and reached Gondar, the capital of Abyssinia, in February 1770. On 14 Nov. 1770, he succeeded in reaching the sources of the Abai, then considered the main stream of the Nile. His 'Travels to Discover the Source of the Nile' appeared in 1790 in five large quarto volumes. The authority of the work, in regard to facts of natural history and human manners, was questioned on its first appearance; but the truth of his descriptions, however, has been amply confirmed by travelers who have visited the same regions. This enterprising traveler lost his life in consequence of an accidental fall down stairs.

BRUCE, Michael, Scottish poet: b. Kinnesswood, Kinross-shire, 27 March 1746; d. 5 July 1767. His father, though a weaver and poor, was ambitious to see his boy secure an education. He was himself a man of great natural talent, and he gave his personal attention to the training of his son. The boy, who was early sent to school, developed a singular liking for literature, poetry and history. However his days at school were irregular for the poverty of the family made it necessary for him to help in its maintenance. This he did by herding cattle on the hills. This had a strong influence on his poetry which is distinguished for tenderness, pathos and a love of nature. Bruce received an education superior to his position in life and, at the age of 15, he was sent to Edinburgh University which he attended from 1762 to 1765. The following year he became a divinity student, but, through lack of means to continue his studies, was forced to become a teacher, an occupation unsuitable to his genius and temperament. Broken in health and disheartened he died of consumption; and it was not until three years after his death that a collection of his poems was published by John Logan, a clergyman, and fellow student of Bruce. Logan is accused of publishing as his own work various of the poems of Bruce, notably, the 'Ode to the Cuckoo'; and for several years a literary battle was waged against Logan by the friends and admirers of Bruce, who also claimed that the hymns published in Logan's poems (1781) were the 'Gospel Sonnets' of Bruce, which had disappeared, though they were well known to have existed. Consult Stephen, William, 'The Poetical Works of Michael Bruce with Life and Writings' (1895); MacKenzie, James, 'Life of Michael Bruce, Poet of Loch Leven' (1905).

BRUCE, Philip Alexander, American author: b. Staunton Hill, Va., 7 March 1856. He was graduated at the University of Virginia in 1876 and at the Harvard Law School in 1879. In 1908 he received the degree of

LL.D. from Washington and Lee University, and in the following year from William and Mary College. He was for many years corresponding secretary of the Virginia Historical Society. He is the author of ‘The Plantation Negro as a Freeman’ (1888); ‘Economic History of Virginia in the 17th Century’ (1895); ‘Short History of the United States’ (1903); ‘Rise of the New South’; ‘Social Life of Virginia in the 17th Century’; ‘Life of General Robert E. Lee’; ‘Institutional History of Virginia in the 17th Century’; ‘Pocahontas and Other Sonnets’ (1912).

BRUCE, William Speirs, Scottish explorer: b. 1 Aug. 1867. He was educated at Edinburgh University. After serving on various Arctic and Antarctic expeditions, he led the Scottish National Antarctic Expedition of 1902–04, discovered 150 miles of the coast-line of Antarctica, which he named Coat's Land, and bathymetrically surveyed a part of the south Atlantic Ocean and Weddell Sea. He has since explored and surveyed Prince Charles Foreland and other parts of Spitzbergen. He is director of the Scottish Oceanographical Laboratory.

BRUCE-JOY, Albert, Irish sculptor: b. Dublin 1842. He studied art at South Kensington and the Royal Academy School of Art, was a pupil of Foley's and studied in Rome for three years. He has twice visited the United States. He has been entrusted with many important commissions, among them being statues of Gladstone, John Bright, Lord Kelvin and Queen Victoria; busts of King Edward VII, King George V, Lord Morley, Matthew Arnold, Chauncey Depew (Lotus Club, New York), Hon. Louden Snowden (Philadelphia); his ideal works including ‘The Young Apollo,’ ‘Faith,’ ‘The Cricketer,’ ‘The Fencer,’ ‘The Boy Scout.’

BRUCH, brooʜ, **Max,** German composer: b. Cologne, 6 Jan. 1838; d. Berlin, 3 Oct. 1920. He studied under Breidenstein and was a special pupil of Hiller, in 1853–57. During this period he completed several of his musical compositions. In 1865 he was director of the musical institute of Coblentz, and from 1870 to 1880 lived in Berlin and Bonn. In 1880 he went to Liverpool to become director of the Philharmonic Society; in 1883 he came to the United States and conducted his own oratorio, ‘Arminius,’ in Boston; in 1887 he was made a member of the Berlin Academy, and in 1890 obtained the title of royal professor. Bruch ranks among the foremost of the modern composers. His best works include ‘The Flight of the Holy Family,’ ‘Ulysses,’ ‘Arminius,’ ‘Lied von der Glocke’ (words by Schiller), ‘Achilles,’ ‘Scenes from the Frithjof's Saga,’ ‘Roman Triumph Song,’ ‘Salamis.’ ‘Kol Nidrei,’ a Hebrew melody for the 'cello, is a favorite with all 'cellists. His four concertos for violin and orchestra rank among the greatest works of their kind.

BRUCHÉSI, broo-kā'zē, **Paul,** Canadian clergyman: b. Montreal, 29 Oct. 1855. He was educated at Montreal Seminary and Issay, France; ordained at Rome 1878; later professor in Laval University, Quebec, and Montreal; canon of Montreal Cathedral 1891, and consecrated archbishop of Montreal, 8 Aug. 1897. He is the author of a number of lectures and other literary works.

BRUCHSAL, brooʜ'säl, a town of Baden, on both sides of the Salzbach, 12 miles from Karlsruhe, now an important railway centre. It is an ancient town, was a common residence of the prince-bishops of Spires from the 12th century, and the residence formerly occupied by them is still standing. This is a building in the rococo style, erected in 1720–70, and in connection with it is a fine garden with fountains. In the church of Saint Peter the prince-bishops were buried. Soap, paper, cigars, etc., are made. Pop. about 15,000.

BRUCHUS, a genus of beetles belonging to the section tetramera and the family *Rhyncophora* or *Curculionidæ.* The antennæ are 14-jointed and are filiform, serrate or pectinated, not geniculated as in the more normal *Curculionidæ.* It contains small beetles which deposit their larvæ in the germs of leguminous plants, and, when hatched, devour their seed. *B. pisi* is destructive to the garden pea.

BRUCINE, broo'sĭn (from Brucea), an alkaloid discovered in 1819 and obtained in the preparation of strychnine, from which it is separated by boiling alcohol. It crystallizes in white and transparent prisms, with a rhomboidal base. It has a very bitter taste but no smell, and is less poisonous than strychnine. It is insoluble in ether and dissolves in a mixture of 850 parts of cold and 500 parts of boiling water. Nitric acid gives it a scarlet, and sulphuric acid a rosy, tint, but both turn gradually to yellow. A solution of copper turns it to violet. These reactions distinguish brucine both from strychnine and morphine. The salts of brucine are tolerably numerous and are prepared by double decomposition or by direct combination of the brucine with the acid. They are for the most part crystallizable and, like the base, have a bitter taste. They are not used in medicine. Symbol $C_{23}H_{26}N_2O_4 + 4H_2O$.

BRUCIOLI, broo-chē-ō'lē, or **BRUCCIOLI, Antonio,** Italian reformer and scholar: b. Florence, about 1500; d. after 1554. In 1522, having become implicated in a conspiracy against Giuglio di Medici, who then governed Florence in the name of Leo X, he took refuge in France, where he became acquainted with the doctrines of the reformers and probably embraced them. On the expulsion of the Medici in 1527 he returned to Florence, but, by his free declamation against monks and clergy, brought his orthodoxy in question and was imprisoned on several charges, among which that of heresy was included. He would have been executed but for the interference of powerful friends, who obtained a commutation of his sentence into banishment. He retired to Venice with two brothers, who were printers, and availed himself of their press to publish a great number of works, of which the most celebrated is a translation of the Bible into Tuscan. The boldness of his annotations caused it to be ranked as a heretical work. Brucioli was living in 1554, but the exact date of his death is not known. The number of his volumes is said to have exceeded that of his years. Among his works are Italian translations of Pliny, Aristotle and Cicero, and annotated editions of Petrarch and Boccaccio.

BRUCITE, a native hydrate of magnesia, having the formula $Mg(OH)_2$. It has a hardness of 2.5 and a specific gravity of about 2.4. Its color is white, often tinted blue or green. At Texas, Pa., it crystallizes in hexagonal (rhombohedral), tabular plates whose bases show pearly lustre while the edges are vitreous to waxy. A fibrous, pearly variety occurs at Hoboken, N. J. Delicate blue and green crystals were found at Tilly Foster, N. Y. Brucite was named for Dr. A. Bruce, an American mineralogist, who first described it as a species.

BRUCK, brook, **Karl Ludwig**, Baron, Austrian statesman: b. Elberfeld, 8 Oct. 1798; d. Vienna, 23 April 1860. In 1821 he went to Trieste in order to take part in the war for Grecian independence, and, remaining there several years, founded the Trieste Lloyd (later the Austrian Lloyd), a combination of insurance societies. In 1848 he was a member of the German National Assembly; after the Vienna revolution of October 1848, he became Minister of Commerce and Public Works. In this office he introduced a number of reforms in the industrial policy of the government, established important telegraph lines, built a number of highways and railroads and founded the Austro-German Postal Union. In 1849 the Emperor gave him the rank of baron, but in 1851 he was compelled to resign his ministry. In 1855 he became Minister of Finance; he was not able to introduce the reforms he wished and when a period of general financial disaster resulted from the Italian war, Bruck was personally blamed. He accordingly obtained his dismissal from the Emperor and the next day committed suicide. He was officially declared innocent one month after his death.

BRUCKER, brook'ėr, **Johann Jakob**, German historian: b. Augsburg, Bavaria, 22 Jan. 1696; d. there, 26 Nov. 1770. He was educated at Jena and in 1744 became pastor at Augsburg. His most important work is a ‹Critical History of Philosophy› (1741–44), in Latin, which was the first complete history of the different philosophical schools. It contains biographical matter of great value.

BRUCKNER, brook'nėr, **Anton**, Austrian organist and composer: b. Ansfelden, 4 Sept. 1824; d. 11 Oct. 1896. He was mostly self-educated, but after serving as organist in the cathedral at Linz he studied for a time in Vienna under Simon Sechter, whom he succeeded as court organist. He later became professor at the Vienna Conservatory and lecturer on music at the university. Bruckner is to some extent an imitator of Wagner; his best-known compositions are his symphonies; he has written also some religious music, including a Te Deum and several masses.

BRUEGEL, or **BREUGHEL**, **BREUGELS**, etc., brē'Hel, a family originating in Brabant and of which no less than 12 individuals — during a period of five generations — were artists. Only one of them is of first-rate importance, but he is sufficient to immortalize the name. This is the founder of the family, Pieter: b. Bruegel, near Breda, about 1528; d. Brussels 1569. He is often spoken of as the Old or Peasant Bruegel, by reason of his subjects, and is to be distinguished from his son, Pieter II, called Hell Bruegel. While the later members of the family may be considered as of the Flemish school, Pieter (I) is of the Dutch school. Pieter Bruegel, the elder, began his studies under a pupil of Hieronymus Bosch, who persuaded him to go to Antwerp and work under P. Coeck d'Alast, painter to Charles V. He did so, but his admiration for his robust compatriot, Bosch, kept him from accepting the Italian tendency of Coeck, and it is to Bosch that we must trace Bruegel's technique and his idea of art. In 1551 he entered the guild of Antwerp as a master painter. Shortly afterward he made a journey to Italy, by way of France, arriving in Rome in 1553. By 1554 he was back in Flanders, again but little influenced by the Italians. He lived at Antwerp till 1563, when he married the daughter of Pieter Coeck and took up his residence at Brussels, where he remained until his death. It is during his last six years that his genius reached its greatest development. He had already accomplished a powerful and original work in his earlier religious pictures and he continued with these subjects. But the realistic observation of Bruegel was more at liberty when, in his last period, he frankly took the life about him as his subject, for it had been that which interested him chiefly even when depicting sacred themes. All the vigorous humor and satire of Bosch appear again in a finer and more profound spirit. The whole outlook of Brouwer, Ostade and Teniers in the 17th century and Millet in the 19th is foreseen, and they never approached their predecessor. The sane and healthy outlook on mankind is supplemented by a magnificent conception of nature. One can think of no other painter who has given the sense of vastness in a landscape and at the same time kept the amazing realism of detail that Bruegel gives us. Best of all, he has a sense of design that carries his philosophic and emotional qualities immediately into the realm of art. He is, in fact, one of the world's great designers, and the admiration he inspires is increased when we reflect that he is the originator of his style instead of inheriting it from others. As painting, whether in tempera (as the ‹Blind Men› at Naples) or in oil (e.g., ‹Winter› at Tournai) his works are masterpieces. Among other important pictures to be mentioned are the ‹Massacre of the Innocents,› at Brussels; ‹The Brigands,› at the University of Stockholm; ‹The Wedding Dinner› at the Vienna Museum, and ‹The Wolf,› in the collection of Mr. John G. Johnson of Philadelphia. His spirited and important engravings have been edited by Van Bastelaer. His eldest son, Pieter the Younger, b. Brussels 1564; d. there 1637, studied with Gillis van Conincxloo at Antwerp. Like his father, he painted rural and genre subjects, but he is generally known as «Höllen-Bruegel,» because of his fondness for representing the infernal regions and subjects like witches, devils and robbers. Jan Bruegel, the Elder: b. Brussels 1568; d. there 1625. The younger son of Pieter the Elder is usually called «Velvet-Bruegel» from the softness and smoothness of his technique. He studied with Goetkind in Antwerp and spent several years in Italy. He returned to Antwerp about 1597 and soon acquired wealth and high honors. He was dean of the painters' guild (1601–02) and, like his intimate friend, Rubens, was official painter to the regents of the Netherlands. His landscapes are important in the development of landscape painting. They usually contain many small figures and are numerous in all the principal European collections. The most important are probably the 54 examples in the gallery of Madrid. His son and pupil, JAN BRUEGEL, THE YOUNGER: b. Brussels 1601; d. 1678. It is difficult to distinguish his work from his father's. For the Bruegel family consult Rooses, 'Geschiedenis der Antwerpsche bilderschule' (Antwerp 1887–90), and Michel, 'Les Brueghel' (Paris 1892).

BRUEIS, broo-ē's, or **BRUYS D'AIGAÏLLIERS, François Paul,** French admiral: b. Uzès, 11 Feb. 1753; d. 1 Aug. 1798. He entered the navy at an early age and gradually rose in the service. In 1798 he was employed to convey Bonaparte and his army, who were to effect the conquest of Egypt and the East, and having managed to elude the vigilance of Nelson, who had been long watching for him, reached the Bay of Abukir, and disembarked the troops in safety. Brueis moored his fleet in a position naturally so strong that he deemed it impregnable; but by the heroic daring of Nelson, he found the precautions which he had taken turned to his disadvantage. In the battle which ensued, he fell fighting boldly, a little before his ship, the *Orient*, of 100 guns, was destroyed. See ABUKIR.

BRUES, brooz, **Charles Thomas,** American entomologist: b. Wheeling, W. Va., 1879. He studied at the University of Texas and at Columbia University; was appointed field agent of the Bureau of Entomology, United States Department of Agriculture 1904–05; curator of invertebrate zoology in the Milwaukee Public Museum 1905–09, and then became instructor in economic entomology at Harvard University. His contributions on embryology and the habits of insects, notably the Hymenoptera—ants, bees, etc., and Diptera — mosquitoes, flies, fleas, etc., are highly instructive. He was editor of the *Bulletin* of the Wisconsin Natural History Society 1907–09; and in 1910 was appointed editor of *Psyche*, a journal of entomology.

BRUGES, broozh, (Flemish *Brugge*), a city of Belgium, capital of West Flanders, situated about 60 miles northwest of Brussels, about eight miles from the sea, surrounded and intersected by canals which connect it with Ostend and other places. By these canals fairly large vessels can reach Bruges; and a ship canal built since 1900 connects it with the sea at Zeebrugge on the North Sea, seven and one-half miles distant. This allows ships of 25 feet draft to reach the wharves of the city. Bruges has over 50 bridges all opening in the middle for the passage of vessels. The Halles (containing cloth and other markets) is a fine old building, with a famous belfry or tower 350 feet high, in which is a fine carillon of 48 bells. Bruges has also a beautiful town hall dating from the 14th century; a palace of justice, noted for a magnificently adorned fireplace; an academy of painting, sculpture and architecture; a public library, etc., and many valuable specimens of architecture and sculpture. In the church of Notre Dame, which has a spire 290 feet high, are the splendid tombs of Charles the Bold and of Mary of Burgundy, his daughter, constructed in 1550, besides many other artistic treasures. The cathedral of Saint Sauveur dates from the 13th and 14th centuries, and is unattractive externally, but has a fine interior, and there are other notable churches. Philip the Good here founded the order of the Golden Fleece in 1430; and the celebrated Jan Van Eyck, or John of Bruges, the supposed inventor of painting in oil, was born here. From the 7th century Bruges was rapidly acquiring importance. It was fortified by Count Baldwin in 837, walled first in 1053 and again in 1270. During the government of the rich and powerful counts of Flanders, who resided there from the 9th to the 15th centuries, its woolen manufactures grew and flourished to an amazing extent. The wealth of the citizens was enormous; a single merchant gave security for the ransom of Jean sans Peur, the last Count of Flanders, to the amount of 400,000 crowns of gold. Under the Austrian dynasty, at the close of the 15th century, the rebellious conduct of the inhabitants of Bruges called upon it such destructive vengeance that henceforth its greatness died away, its trade was transferred to Antwerp, and the religious persecution and ferocity of the Spanish under Philip II and the Duke of Alva completed the process of its ruin. During the wars of the Spanish and Austrian successions the city was besieged by the Dutch and the French. In 1794 it was taken by the latter, and from 1814 to 1830 it belonged to the Netherlands. In 1914 it was taken by the Germans and held by them during the war. With Zeebrugge it formed an important base for the fitting out of submarines in the undersea campaign directed against England's commerce. The remains of ancient buildings, abandoned monasteries and streets half deserted from the diminished population of the modern city give Bruges an antiquated and venerable appearance. Many of the houses are very old, but in a state of excellent preservation. Bruges is still, by means of its canals, an entrepôt of Belgian commerce. The chief articles manufactured here are lace, linen, damasks, light woolen goods, cottons, mixed stuffs, beer, etc. It exports agricultural produce and manufactured goods, and imports wine, oil, colonial produce, etc. Pop. 54,000. Consult Gilliat-Smith, 'Bruges' (in 'Mediæval Towns Series,' 1901); Duclos, 'Bruges; histoire et souvenirs' (1910).

BRUGG, a town in the Swiss canton of Aargau, on the right bank of the Aar, and near the mouth of the Reuss, 36 miles east-southeast of Basel by rail. Among the industries are silk mills, machine shops, chemical works and a power-house. Near it is the site of Vindonissa, the chief Roman station in Helvetia; and it was also the cradle of the house of Hapsburg, whose ruined castle, founded in 1020, crowns a wooded height two miles distant. Nearer is the abbey of Königsfelden (1310; converted in 1872 into an asylum) in the vaults beneath which are interred many of the members of the Austrian royal family. Zimmerman, the philosopher, was born here in 1728. Pop. about 3,000.

BRUGMANN, broog-man, **Friedrich Karl,** German philologist: b. Wiesbaden, 10 March 1849. He was educated at Halle and Leipzig; was instructor in the gymnasium at Wiesbaden and at Leipzig; and in 1872–77 was assistant at the Russian Institute of Classical Philology at the latter place. In 1877 he was lecturer at the University of Leipzig, and in 1882 became professor of comparative philology there; in 1884 he took the same position at the University of Freiburg, but returned to Leipzig in 1887 as successor to Curtius. He is one of the chief representatives of the new school of philologists and his researches have done much to revolutionize the study of philology. This school, known as that of the «Neo-grammarians,» followed Leskien, especially in urging the inviolability of laws of sound changes, and in emphasizing the working of analogy as an important linguistic factor, as well as in laying stress on the observation of phonetic laws and their operation in modern languages. As joint editor with Curtius of ‘The Studies in Greek and Latin Grammar,’ he wrote an article for this work on ‘Nasilis Sonans,’ in which he defended theories so radical that Curtius afterward disclaimed them. His conclusions are now generally accepted. His most important work, summarizing his conclusions, is ‘Outline of the Comparative Grammar of the Indo-Germanic Languages’ (translated into English); he also wrote ‘Morphological Researches in the Indo-Germanic Languages’ (with Osthoff); ‘A Problem of Homeric Textual Criticism’ (1870); ‘Lithuanian Folk Songs and Tales’ (1882); ‘The Present Position of Philology’; ‘Greek Grammar’; and ‘Short Comparative Grammar’ (1902). Brugmann was knighted by the King of Saxony, and in 1896 he was invited, with other distinguished scholars, to attend the jubilee of Princeton University, where he received the degree of doctor of laws.

BRUGSCH, Heinrich Karl, German Egyptologist: b. Berlin, 18 Feb. 1827; d. Charlottenburg, 9 Sept. 1894. A work entitled ‘Scriptura Ægyptiorum Demotica,’ published in 1848, gained him the favor of Alexander von Humboldt and Frederick William IV, the latter of whom enabled him to complete his studies by visiting the museums of Paris, London, Turin and Leyden. In 1853 he made his first visit to Egypt and assisted Mariette in his researches, being appointed on his return in the following year assistant in the Berlin Egyptian Museum. He accompanied the Prussian embassy to Persia in 1860, and four years later became consul at Cairo. Returning in 1868, he was appointed to the chair of Egyptology at Göttingen, but soon resigned in order to take charge of the Cairo school of Egyptology. He was soon raised to the rank of bey, and some time afterward to that of pasha. In 1876 he came to the United States as Egyptian commissioner to the Centennial Exposition at Philadelphia. In 1883 he traveled in Egypt, Syria, Greece and Italy, with Prince Frederick Charles of Prussia, and in 1885–86 he twice visited Persia, partly on official business. He was again in Egypt in 1891, and in the following year he made a journey to the Libyan Desert. Brugsch's chief work is the Hieroglyphisch-demotisches Wörterbuch’ (1867–82). His other writings include ‘Reiseberichte aus Ägypten’ (1855); ‘Grammaire Démotique’ (1855); ‘Monuments de l'Egypte’ (1857); ‘Geographische Inschriften altägyptischer Denkmäler’ (1857–60); ‘Histoire d'Egypte’ (1859); ‘Recueil des Monuments Egyptiens’ (1862–85); ‘Reise der königlich Preussischer Gesandtschaft nach Persien’ (1862–63); ‘Hieroglyphische Grammatik’ (1872); ‘Geschichte Ägyptens unter den Pharaonen’ (1877); ‘Dictionaire Géographique de l'ancienne Egypte’ (1877–80); ‘Religion und Mythologie der alten Ägypter, nach den Denkmälern’ (1888); ‘Thesaurus Inscriptionum Ægyptiacarum’ (1883–91); ‘Die Ägyptologie’ (1890); ‘Aus dem Morgenlande, Altes und Neues’ (1893), etc. His ‘History of Egypt from the Monuments’ has appeared in English. In 1894 his autobiography appeared under the title ‘Mein Leben und Wandern.’

BRÜHL, brēl, **Heinrich** (COUNT VON), Saxon politician: b. Weissenfels, Prussia, 13 Aug. 1700; d. Dresden, 28 Oct. 1763. As a page he gained the favor of Frederick Augustus I of Poland, and on the death of the King in 1733, the crown of Poland with the other regalia being, through the good fortune of Brühl, entrusted to him, he carried them immediately to the new Elector, Augustus III, and showed the greatest activity in promoting his election. He had cunning and skill sufficient to govern his master and get rid of his rivals and succeeded in keeping everybody at a distance from the King. No servant entered his service without the consent of Brühl, and even when he went to the chapel all approach to him was prevented. Brühl kept 200 domestics; his guards were better paid than those of the King himself, and his table more sumptuous. Frederick II says of him, «Brühl had more garments, watches, laces, boots, shoes and slippers, than any man of the age. Cæsar would have counted him among those curled and perfumed heads which he did not fear»; but Augustus III was no Cæsar. When this idle prince loitered about smoking, and asked, without looking at his favorite, «Brühl, have I any money?» «Yes, sire,» was the continual answer; and to satisfy the King's demands he exhausted the state, plunged the country into debts and greatly reduced the army. At the beginning of the Seven Year's War it comprised but 17,000 men, and these were compelled to surrender at Pirna from want of the necessary supplies. Brühl fled with the King, the pictures and the china, to Poland; but the archives of the state were left to the victor. He was no less avaricious of titles and money than of power. An examination after his death showed that he owed his immense fortune to the prodigality of the King rather than to unlawful means of accumulation. His own profusion was often beneficial to the arts and sciences.

BRUHNS, bröns, **Karl Christian,** German astronomer: b. Plön, Holstein, 22 Nov. 1830; d. Leipzig, 25 July 1881. He was the son of a locksmith; going in 1851 as locksmith and mechanic to Borsig, and then to Berlin with Siemens and Halske, he attracted the attention of Encke by his remarkable powers as a computer, and was appointed in 1852 as assistant, and in 1854 as observer, in the Berlin Observatory, and in 1859 as instructor in the university. In 1860 he was called to Leipzig as professor of astronomy and director of the new observatory to be constructed there, which, under his skilful direction, grew into one of the finest structures of its kind in Europe. He is known as the discoverer of five comets, an able computer of cometary and planetary orbits, and for his important work in geodesy in connection with the European triangulation.

BRUISE, or **CONTUSION**, an injury caused by a blow or sudden pressure, in which the skin is not wounded and no bone broken or dislocated. Both terms, but more particularly the latter, are employed in surgery to include all such injuries from a black eye to a thoroughly crushed mass of muscle. In the slighter forms of this injury, as in ordinary simple bruises, there is no tearing but only a concussion of the tissues, the utmost damage done being the rupture of a few small blood vessels, occasioning the discoloration always observed in these cases. In more severe contusions, the subjacent structures — muscles, connective tissue, vessels, etc.— are more or less ruptured, and in extreme cases are thoroughly crushed and usually become gangrenous. The quantity of blood extravasated depends chiefly upon the size and number of the ruptured blood vessels, but partly also on the nature of the textures of the injured part. Thus, a lax tissue, as that of the eyelids, favors the escape of blood into the surrounding parts. Simple and not very severe bruises require little treatment other than the rest necessary for the avoidance of pain, but the removal of the swelling and discoloration may be hastened by the application of various local stimulants, which seem to act by accelerating the circulation through the bruised part and promoting the absorption of the effused fluid. Friar's balsam, compound soap liniment or poultices made with the roots of black bryony beaten to a pulp are popular remedies of this class. Tincture of arnica has a great reputation, but experiments have made it very doubtful whether it is any more efficacious than simple spirit of the same strength. A solution of sulphurous acid, and hazeline and other preparations of the American witch-hazel are of more value. They should be kept constantly applied to the bruised part on lint or cotton wool. Pugilists, who are probably better acquainted with ordinary bruises than any other class of men, are in the habit of removing the swelling of the eyelids that often naturally occurs during a prize fight to such an extent as to close the eyes, by at once puncturing the eye-lids at several points with a lancet; and their favorite remedy for a black eye or other bruise on the face is a fresh beefsteak applied locally as a poultice. Bruises of a more severe nature, as when there is much breaking or crushing of the tissues, must, of course, at once be referred to the care of a surgeon.

BRÜILL, Ignaz, Austrian pianist and composer: b. Brossnitz, 7 Nov. 1846; d. 17 Sept. 1907. He was educated at Vienna under Epstein and Dessoff, and played at concerts there and in London. His first composition appeared in 1861 and afterward he became instructor at a school of music in Vienna and has won distinction as a composer. His works include several numbers for the piano, orchestral pieces and operas, among them ‹The Beggar of Samarkand,› ‹The Golden Cross,› ‹Bianca,› ‹Queen Marietta,› ‹The Heart of Stone› and ‹The Hussar.›

BRUMAIRE, brü-mãr', the second month of the year in the French revolutionary calendar. It commenced on 23 October and ended on 21 November, thus comprising 30 days. It received its name from the fogs that usually prevail about this time. The 18th of Brumaire, VIII year (9 Nov. 1799), is celebrated for the overthrow of the Directory and the establishment of the sway of Napoleon. See CALENDAR.

BRUMIDI, broo-mē'dē, **Constantine**, Italian painter: b. Rome, 20 June 1805; d. Washington, D. C., 29 Feb. 1880. He studied at Rome, becoming a member of the Academy of Saint Luke at the age of 13. He painted frescoes in the Vatican under Gregory XVI, besides adorning other palaces in his native city. The occupation of Rome by the French caused him to emigrate to America, and in 1852 he became a citizen of the United States. After settling in this country, he executed much of the decoration of the national capitol, forming a belt about the base of the interior of the dome, the first frescoes in America. They represent ‹The Apotheosis of Washington› and various scenes from American history, in addition to work of an allegorical character. He also decorated churches in Philadelphia and in the City of Mexico.

BRUMMAGEM JOE. See CHAMBERLAIN, JOSEPH.

BRUMMEL, George Bryan («BEAU BRUMMEL»), English dandy: b. London 1778; d. Caen, 29 March 1840. He was educated at Eton and Oxford, at both of which places he acquired great distinction by his taste in dress, which afterward made him the autocrat in the world of fashion. At the age of 16 he casually made the acquaintance of the Prince of Wales, afterward George IV, who conceived a particular fancy for him and made him a cornet in his own regiment, the 10th Hussars. Brummel was now introduced into the most aristocratic society in England, and through the favor of the Prince had rapid promotion in the army, though his carelessness was such that he often did not know his own troop. The death of his father in 1794 put him in possession of a fortune of £30,000, which he expended in a course of sumptuous living, extending over a period of 21 years, during which his dicta on matters of etiquette and dress were received in the *beau monde* as indisputable. He kept a magnificent bachelor establishment, gave splendid dinners and basked in all the sunshine that youth, money and princely favor could bestow. But the fickle temper of the Prince Regent at last tired of Brummel and an estrangement took place. The beau's creditors now began to be clamorous and in 1814 he crossed the Channel to Calais, where he resided for many years, partly supported by the remains of his own fortune and partly by remittances from friends in England. In 1824, when George IV passed through Calais on his way to Hanover, Brummel ventured again to address himself to him, but was unceremoniously repulsed. Subsequently to this he was appointed consul at Caen, but after holding this office for a few years it was abolished as unnecessary, and he was reduced to absolute poverty. His mind, too, gave way, and he died in the Asylum du Bon Sauveur, in Caen, France. Bulwer's ‹Pelham› is said to be founded on Brummel's life. Consult Jesse, ‹Life of George Brummel, Esq.› (new ed., London 1885), and Boutel de Monvel, ‹Beau Brummel and His Times.›

BRUMMITT, Dan Briarley, Methodist clergyman and editor: b. Batley, England, 13 Aug. 1867. He came to the United States in 1882 and was educated in Kansas Agricultural College, Baker University, Drew Theological Seminary and New York University. He was ordained as Methodist Episcopal minister in 1893 and held various churches in Kansas from that date until 1897. He was assistant editor of *The Epworth Herald* 1901–10, on which date he became manager of the circulation department of the Methodist Book Concern and, in 1912, editor-in-chief of *The Epworth Herald.* He is author of 'Epworth League Methods' (1906), and 'The Efficient Epworthian' (1914).

BRUN, broon, or **BRUNN, Malte-Conrad** (generally known as MALTE-BRUN), Danish geographer and politician: b. Thisted, Jutland, 12 Aug. 1775 d. 14 Dec. 1826. While yet very young he produced some poems which gave great promise of his rising to eminence as a poet, though his father had destined him for the Church. About this time the French Revolution called forth a host of ardent champions of the cause of progress throughout Europe, and the young poet embraced it with enthusiasm. He abandoned the Church for the bar and subsequently became editor successively of two journals, in which his advocacy of Liberal principles provoked a state prosecution that compelled him to take refuge in the Swedish island of Hven, once the residence of Tycho Brahe. Not long after, his admiration of Napoleon Bonaparte, then rapidly advancing to the head of affairs, prompted him to take up his abode in France; but the elevation of his idol to the post of consul for life opened Brun's eyes to his ambitious designs, and for the time he withdrew from the pursuit of politics. He now directed his attention to the science of geography. In 1803 he published, along with Mentelle and Herbin, the commencement of 'Géographie, mathématique, physique, et politique de toutes les parties du monde,' a work which was completed in 16 volumes in 1807 and in the composition of which Brun's share amounted to about a third. Before the completion of this work his reputation as a writer had been firmly established, and in 1806 he received an appointment on the staff of the *Journal des Débats,* for which he continued to write articles on foreign politics until his death. In 1808 appeared his 'Tableau de la Pologne,' and the same year he joined M. Eyriès in starting the 'Annales des Voyages, de la géographie, et de l'histoire,' which proved the introduction into France of regular periodical geographical literature. In 1810 was published the first volume of his 'Précis de la géographie universelle,' completed in eight volumes in 1829 and reissued in 12 volumes in 1831. During the Hundred Days, Brun adhered to the legitimist cause and published an 'Apologie de Louis XVIII.' Toward the end of 1821 he lent powerful assistance in establishing the Société de Géographie. Besides the works already mentioned, he was the author of various geographical and political treatises too numerous to particularize. His son, Victor Adolphe, was also a noted student and professor of geography.

BRUNANBURGH, broo-năn-bur'ō, Scotland, the scene of a battle in which Athelstan and the Anglo-Saxons defeated a force of Scots, Danes, etc., in 937; locality very doubtful. The battle forms the subject of one of the oldest Anglo-Saxon poems.

BRUNCK, broonk, **Richard François Philippe,** French critic: b. Strassburg, 30 Dec. 1729; d. same place, 12 June 1803. He made rapid progress in learning when he studied with the Jesuits in Paris, but neglected study and was engaged for a while as military commissary in the Seven Years' War. While in winter quarters at Giessen, as commissary of war during the French campaigns, he resided with a professor who, by his advice and example, revived his love of letters and led him to the study of the classics. When Brunck returned to Strassburg he devoted all his leisure time to Greek, and at the age of 30, and while holding public office, attended the lectures of the Greek professor of the university. The zeal which had encouraged him to undertake this laborious study was increased by the pleasure of overcoming difficulties, and he became fixed in the conviction that all the instances of apparently careless writing in the Greek poets were only errors of the transcribers. Entertaining this opinion, he altered whatever displeased him, overthrew the order of the verses and permitted himself liberties which criticism must needs reject. This arbitrary process is so visible, even in the editions he has published, that much caution is required in using them. Brunck has, nevertheless, been of essential service to Greek literature, and since the revival of letters few scholars have so effectually promoted it. He published a valuable edition of Virgil. Of his Greek editions mention may be made of those of the 'Analecta,' 'Apollonius Rhodius,' 'Aristophanes,' 'The Gnomic Poets' and his masterpiece, 'Sophocles,' for which the King allowed him a pension of 2,000 francs. At this time the French Revolution interrupted his studies. He adopted the new ideas with enthusiasm but without deviating from the principles of moderation. He was arrested at Besançon during the Reign of Terror and did not obtain his liberty until after the death of Robespierre. In 1791 and again in 1801 economical reasons obliged him to sell part of his library. As he was passionately fond of his books, and his former fortune had enabled him to collect an excellent library this was a severe privation. From this time Greek became his aversion; but he prepared an edition of Terence and had Plautus ready for publication when he died. Many of his papers are in the library at Paris.

BRUNDUSIUM, or **BRUNDISIUM.** See BRINDISI.

BRUNE, broon, **Guillaume Marie Anne,** Marshal of France: b. Brives-la-Gaillarde, 13 March 1763; d. 2 Aug. 1815. While young he went to Paris to study law. At the breaking out of the Revolution he was a printer and had made himself known by some small pieces of his own composition. He now devoted himself ardently to politics, was connected with Danton, and played an active part in the tempests of that period. Till 10 Aug. 1792 he was engaged in publishing a daily newspaper. Afterward he went as civil commissary to Belgium. In 1793 he entered the military service in the revolutionary army in the Gironde. He aided Barras to put down the Jacobins, who had assaulted the camp of Grenelle, 10 Oct. 1795. Afterward he distinguished himself as general of brigade in the Italian army, in the battle of Arcola and in the attack on Verona. When the Directory of Switzerland declared war Brune received the chief command of an army, entered the country without much opposition in January 1798, and effected a new organization of the government. In 1799 he received the chief command in Holland, defeated the British, 19 September, near Bergen, and compelled the Duke of York to agree to the treaty of Alkmaar, 18 October, by which the British and Russians were to evacuate the north of Holland. In January 1800, he was made a councillor of state, and was placed at the head of the Army of the West, in occupation of La Vendée, and contributed greatly to the re-establishment of tranquillity in the revolted province. He was appointed commander-in-chief of the Italian army 13 August. Toward the end of December he led his troops over the Mincio, conquered the Austrians, passed the Adige 8 Jan. 1801, took possession of Vicenza and Roveredo, and concluded an armistice, 16 January at Treviso, with the Austrian general, Bellegarde, by which several fortified places in Italy were surrendered to the French troops. When peace recalled him to the council of state toward the end of November 1802, he laid before the legislative body for confirmation the treaty of peace with the court of Naples. Next year he went as Ambassador to Constantinople. He prevailed there at first over the British party, and received from the Turkish ministry the highest marks of honor; but when new dissensions arose between the two powers he left Turkey. During his absence, 19 May 1804, he was appointed marshal of the empire. At the end of 1806 Napoleon appointed him governor-general of the Hanseatic towns, and soon after commander of the troops in Swedish Pomerania against the King of Sweden. This monarch invited the marshal to a personal interview, in which he endeavored to convert him to the cause of Louis XVIII. Brune refused every proposal. After the revolution of 1814 he acknowledged Louis XVIII, and received the cross of Louis, but no appointment. This was the cause of his declaring himself for Napoleon immediately upon his return. He received the chief command of an important army in the south of France and was made a peer. When circumstances changed again he delayed a long time before he gave up Toulon, which was in his possession in 1815, to the troops of Louis XVIII, and sent in his resignation to the King. This circumstance, the severities exercised by his command, and a report that he was the murderer of the Princess Lamballe, excited popular feeling against him. While retiring from Toulon to Paris he was recognized at Avignon by a royalist mob, which broke into his hotel and shot him. His body was exposed to the most shameful insults, and then thrown into the river Rhone. Consult ‘Notice historique sur la vie politique et militaire du Maréchal Brune’ (Paris 1821); and Conchard, Vermeil de, ‘L'Assassinat du Maréchal Brune’ (Paris 1887).

BRUNEI, broo-nā'ē, **BRUNI**, or BORNEO PROPER, a state lying northeast of Sarawak, in the island of Borneo. It has an area of 4,000 square miles and a population of about 30,000. The territory forms a triangle, having for a base the coast line from a point three miles north of the mouth of the Baram River to the mouth of the Timbang. This is all that remains of the old Malay Sultanate of Bruni, which is now under the protection of the British Crown. The town of Bruni, the ancient capital of the sultans, is built over the water on the river Bruni, not far from its mouth. Pop. about 15,000. A British protectorate over Brunei was proclaimed in 1888, as well as over North Borneo (q.v.) and Sarawak (q.v.). Thus the whole of Borneo — the largest island in the world — is divided between the Dutch and British. On 2 Jan. 1902, by treaty, the Sultan of Brunei handed the general administration over to a British resident, acting under the governor of the Straits Settlements, who is high commissioner for Brunei. The Sultan Mohammed Jemal-ul-alam (b. 1889) succeeded his father in 1906. He receives $7,000 per annum from state funds and his two chief ministers are paid $3,500 each. There is but little manufacturing industry beyond the processes of reducing the raw products to a portable condition. The chief products exported are cutch (q.v.), coal, rubber and sago; imports consist mainly of rice, tobacco, tools and cloth. Most of the trade is with Singapore, and a regular steam launch service is maintained with Labuan (43 miles). The revenue falls short of the expenditure, and the state is run at a loss by the British Crown. For bibliography see BORNEO.

BRUNEL, broo-nĕl', **Isambard Kingdom**, English engineer: b. Portsmouth (son of Sir Marc Isambard Brunel, q.v.), 9 April 1806; d. 15 Sept. 1859. He was educated at the Henri IV College at Caen, France. The bent of his genius was toward mechanical pursuits, and at the age of 20 he commenced practical engineering under his father at the Thames Tunnel, for which he acted as resident engineer. During the progress of the works he was more than once in imminent danger of his life by the breaking in of the river, and only saved himself by swimming. His attention was mainly directed to steam navigation and railway engineering, and of his works in these departments may be mentioned, among others, the *Great Western* (1838), *Great Britain* (1845) and *Great Eastern* (1858) steamships; the entire works on the Great Western Railway, to which he was appointed engineer in 1833; and the railway viaduct over the Tamar at Saltash. He was also the engineer of the Hungerford suspension bridge. He designed many docks at English seaports, including those of Monkwearmouth, Plymouth, Briton Ferry and Milford Haven. The genius of the younger Brunel was undoubted, but in carrying through his operations he was, like his father, too apt to regard merely the attainment of a grand and brilliant result without taking into consideration the losses and expense which might thereby be occasioned to those who had invested their capital in the undertaking. This was more especially the case with the Great Western Railway. While on board the *Great Eastern* — his last work — the day before she quitted the Thames on her first disastrous cruise, Mr. Brunel was suddenly seized with paralysis and had to be carried home. In a week afterward he expired. He became a fellow of the Royal Society in 1830, and D.C.L. of Oxford in 1857.

BRUNEL, Sir Marc Isambard, English engineer: b. Hacqueville, near Rouen, 25 April 1769; d. 12 Dec. 1849. He was the son of a Normandy farmer, and was educated at the seminary of Saint Nicaise, Rouen. From early boyhood he displayed a decided turn for scientific and mechanical pursuits, amusing himself with the construction of ships, musical instruments and machines of different sorts. At the age of 15 he went to Rouen, where he took a course of lessons in drawing, perspective and hydrography. In 1786 he entered the French naval service and made several voyages to the West Indies, in which he distinguished himself both by his inventive mechanical genius and the attention and ability with which he discharged the duties of a seaman. In 1793 he returned to France, and, having paid a visit to Paris, and taken part in the proceedings at one of the political clubs, he narrowly escaped proscription by venturing to oppose the ferocious doctrines then current, and was obliged to make his escape to America. Shortly after his arrival there he joined a party of Frenchmen in an expedition to explore the regions around Lake Ontario, and in 1794 he was appointed one of the surveyors of the canal now connecting Lake Champlain and the river Hudson. He was afterward employed, both as engineer and architect, on various undertakings in the city of New York, including the erection of forts for its defense and the establishment of an arsenal and foundry. He submitted a highly ornamental design for the national capitol at Washington, which was not accepted; but he was engaged in building the Bowery Theatre, New York, which was destroyed by fire in 1821. In 1799 he went to England and settled at Plymouth, where he married Miss Sophia Kingdom, whom he had formerly known at Rouen. His first work in this country was the construction of a copying-machine; and he soon established his reputation as a mechanician by the invention of a machine for making the block-pulleys for the rigging of ships, which effected an immense saving in labor and expense and is still in full operation in English naval dockyards. In 1820, he also made plans for bridges at Rouen and Saint Petersburg. Of Brunel's subsequent achievements may be mentioned more especially the erection of the steam saw-mill in Chatham dockyard; a machine for making seamless shoes for the army; machines for making nails and wooden boxes, for ruling paper and twisting cotton into hanks; and lastly, a machine for producing locomotion by means of carbonic acid gas, which, however, though partially successful, was ultimately abandoned. But the great work by which his name will be transmitted to posterity was the Thames Tunnel, which, though almost a complete failure as a commercial speculation, was nevertheless a wondrous monument of engineering skill and enterprise. It was commenced in March 1825, and opened to the public in 1843, after a multitude of disasters and obstacles had been endured and surmounted. He was elected a fellow of the Royal Society in 1814, and vice-president from 1832–33. He received the order of the Legion of Honor in 1829, and in 1841 the honor of knighthood was conferred on him. Consult Beamish, Richard, 'Memoirs of Sir Marc Isambard Brunel' (1862).

BRUNELLESCHI, broo-nĕl-lĕsk'ē, **Filippo di Ser Lappi,** Italian architect: b. Florence 1377; d. same place, 15 April 1446. He first studied painting and sculpture, and brought the art of perspective to perfection; but as an architect he gained most distinction, having, according to his countrymen, revived the Doric, Ionic and Corinthian orders. He invented various ingenious mechanical contrivances. He applied himself particularly, however, to architecture, and learned the art of drawing to make his architectural plans, statuary to adorn them and mechanics that he might be able to raise the materials. He was also profoundly versed in mathematics and geometry. He is said to have drawn views of the finest monuments in Florence in perspective — an art which then excited much astonishment. This varied knowledge prepared him for bold and difficult undertakings, and he gained the name of the restorer of architecture. As a statuary he was much indebted to his intimate connection with Donatello, who was then very young but very able. Both went to Rome. Here Brunelleschi conceived the idea of restoring architecture to the principles of the Greeks and Romans in the hope of making the revived classic forms supersede the Gothic then in vogue. When the architects assembled, in 1407, at Florence to consult on the building of the dome of the cathedral of Santa Maria, the plan which Brunelleschi proposed received but little attention, and he went back to Rome.

It was necessary, however, to have recourse to him, as the undertaking far surpassed the powers of the other architects. He engaged to erect a dome which, by its own weight and by the strong connection of its parts, should hang suspended. This proposal seemed so wonderful that the author was regarded as insane. As all other plans, however, failed to answer the expectations of the magistrates, Brunelleschi was again recalled and ordered to explain the mode in which he intended to execute his plan. This he refused to do, but built two small chapels according to his new system. On this the charge of erecting the dome was committed to him. Aided only by his own genius, he accomplished the work, which remains one of the boldest creations of the human mind. But the ingenious lantern, which formed the upper part of the dome, was not finished when he died in 1444. It was completed, however, according to his first design. Few monuments of architecture are so noble as this wonderful building. Only the dome of Saint Peter's in Rome, which was built since, excels it in height, but is inferior to it in lightness and grandeur of style. Michelangelo said it was difficult to imitate Brunelleschi and impossible to excel him. Brunelleschi was the author of a great number of other masterpieces of architecture.

BRUNER, Lawrence, American entomologist: b. Catasaqua, Pa., 2 March 1856. A graduate of the University of Nebraska, he received an appointment as assistant on the United States Entomological Commission in 1880, and as field agent for the United States Department of Agriculture at the University of Nebraska in 1888, where he became instructor in entomology in 1890 and professor in 1895. In 1897–98 he traveled in Argentina as field agent again for the United States Department of Agriculture. His published writings include ‘The Destructive Locust of Argentina’ (2 reports, 1898 and 1900); ‘Locusts of Paraguay’ (1906); ‘South American Tetrigidæ’ (1912), and in co-authorship a ‘New Elementary Agriculture’ (9th ed., 1911).

BRUNET, broo-nā′, **Jacques Charles,** French bibliographer: b. Paris, 2 Nov. 1780; d. same place, 14 Nov. 1867. He began his bibliographical career by the preparation of several auction catalogues, of which the most interesting is that of the Count d'Ourches (Paris 1811), and of a supplementary volume to Cailleau's and Duclos' ‘Dictionnaire bibliographique’ (Paris 1802). In 1810 was published the first edition of his ‘Manuel du libraire et de l'amateur des livres,’ in three volumes, which gained such universal applause that in 1814 a second, and, in 1820, a third, edition, of four volumes each, were demanded. This work showed him the worthy successor of the meritorious Debure. A sixth edition of his great work appeared between 1860 and 1865 in six volumes, the last containing a Table Méthodique, or classified catalogue, in which the works are arranged in classes according to their subjects.

BRUNETIÈRE, broon-tyār′, **Ferdinand,** French orator and literary critic: b. Toulon, France, 19 July 1849; d. Paris, 9 Dec. 1906. He was educated at the Lycée Louis-le-Grand, Paris. From 1886 to 1905 he was professor of French language and literature at the Ecole Normale, Paris, and in 1905–06 was ordinary lecturer of the Société des Conférences, Paris. He lectured at the Odéon Theatre and the Sorbonne, Paris; at the Johns Hopkins University, Baltimore, Md., and throughout the United States. He received the cross of the Legion of Honor and was elected member of the French Academy. He published ‘Etudes critiques’; ‘Le roman naturaliste’; ‘Histoire et littérature’; ‘Questions de critique’; ‘L'Evolution des genres dans l'histoire de la littérature’; ‘Manuel de littérature française.’ He was also editor of the *Revue des Deux Mondes* and contributed to the ‘Catholic Encyclopedia.’

BRUNHILDA, broon-hĭl′da̤, the name of (1) a legendary, (2) a historical person. (1) In the ‘Nibelungenlied,’ the young and stalwart Queen of Iceland, wife of Gunther, the Burgundian King. She passionately hated Kriemhild and her husband, Siegfried, who had once been her own lover; and she caused his murder by the hands of Hagen. Originally she was identical with the Norse Walkyrie Brynhildr, who, for a fault, was stripped of her divinity by Odin and sank into a charmed sleep, from which she was awakened by Sigurd (Siegfried). (2) The daughter of the Visigothic King Athanagild, who married King Sigbert of Austrasia in 567, and afterward, as regent of her two grandsons, Theodebert II, King of Austrasia, and Theodoric II, King of Burgundy, divided the government of the whole Frankish world with her rival Fredegunda, who governed Neustria for the youthful Clotaire II. On the death of Fredegunda in 598, she seized on Neustria, and for a while united under her rule the whole Merovingian dominions, but was overthrown in 613 by a combination in their own interests of the Austrasian nobles under the nominal leadership of Clotaire II, and put to death by being dragged at the heels of a wild horse.

BRUNI, broo′nē, **BRUNO,** or **BRUNUS, Leonardo** («Aretino,» from his birthplace), Italian humanist: b. Arezzo 1370; d. Florence, 9 March 1444. He studied law and philosophy at Florence, but under the influence of the Greek scholar Chrysoloras finally took up the study of the classics. In 1405 he obtained a position as papal secretary, an office which he held under four Popes, Innocent VII, Gregory XII, Alexander V and John XXIII. He went with the latter to the Council of Constance in 1414, but in 1415 he moved to Florence, where he devoted himself to literary work. Here he wrote his history of Florence in 12 volumes, for which service he obtained the right of citizenship and was made state secretary there in 1427. He translated the works of Aristotle, Plato, Plutarch, Demosthenes and Æschines. He wrote also ‘Commentarius Rerum Suo Tempore Gestarum’; ‘De Origine Urbis Mantuæ’; ‘De Romæ Origine’; and ‘Epistolæ Familiares.’

BRUNI ISLAND, Australasia, an island off the southern part of the east coast of Tasmania, from which it is separated by D'Entrecasteaux Channel. It has a length of 32 miles, a varying breadth of 1 to 11 miles, and an area of 160 square miles. Coal is mined.

BRUNINGS, Christian, Dutch engineer: b. Neckerau 1763; d. 1805. In 1769 the states of Holland appointed him general inspector of rivers. This introduced him to a share in several important commissions; for instance, that for the improvement of the dike system in 1796; that for draining the tracts between Nieuwskogs and Zevenhoven in 1797, etc. His most important works were his improvements in the diking of the lake of Haarlem, the improved diking and deepening of the Oberwasser, which at high tides often inundated vast extents of country, together with the change in the course of the Waal and the canal of Pannerde, by which the beds of the Rhine, the Waal and the Leck were improved.

BRUNLEES, Sir **James,** Scottish civil engineer: b. Kelso 1816; d. Wimbledon 1892. His father was gardener to the Duke of Roxburghe's agent, and as a youth he was employed to make a survey of the estate and thus saved enough money to take him to Edinburgh University. He was assistant engineer on the Bolton and Preston line in 1838; assisted in the construction of the Lancashire Railway; constructed the São Paulo Railway, Brazil; in conjunction with Douglas Fox, built the Mersey Railway, with the tunnel under the river between Birkenhead and Liverpool, at the completion of which (1886) both engineers were knighted; and carried through (1868–77) the extensive Avonmouth Docks at Bristol.

BRÜNN, capital and important city of Moravia, and of a circle of the same name, on the railway from Vienna to Prague, 70 miles north-by-east of Vienna, and nearly encircled by the rivers Schwarza and Zwittawa. It consists of an older portion in the centre, surrounded by fine promenades and pleasure-grounds that have taken the place of the old walls and ramparts, and of extensive newer quarters and suburbs surrounding this. It contains a cathedral and other handsome churches; a landhaus, where the provincial Diet meets; several splendid palaces, a gymnasium, polytechnic institute, museum, botanic garden, etc. It has extensive manufactures of woolens, which have procured for it the name of the Austrian Leeds, and in some 70 works employs about 12,000 hands. Other industries embrace cotton, linen, jute, machinery, hardware, chemicals, soap and candles, beer and spirits. It is the centre of the Moravian commerce, a great part of which is carried on by fairs held at Brünn every three months. Near it is the fortress of Spielberg, on a hill about 940 feet high, in which Baron Trenck and Silvio Pellico were confined, and which now serves only as a prison. It is surrounded with finely laid-out grounds. Brünn was formerly a free imperial city, an important fortress and the residence of the margraves of Moravia. It was unsuccessfully besieged by the Taborites in 1428; by Torstenson in 1645; by the Prussians in 1742. It was occupied by the French in 1805, and Napoleon made it his headquarters after the battle of Austerlitz. It was taken again by a division of the French army in 1809, when it suffered severely. In 1866 it was occupied by the Prussians. Brünn is the seat of a United States consular agent. The city's affairs are administered by a council of 48 and an executive board of 11 members. Pop. about 125,000.

BRUNNE, brŭn, **Robert of,** the name by which Robert Manning, a monk of the order founded by Saint Gilbert of Sempringham, is usually designated. His monastery was in Lincolnshire, near the modern town of Bourn, and he lived in the reigns of Edward II and Edward III. His chief work is his ‹Handlynge Synne,› a free and amplified translation into English verse of William of Waddington's ‹Manuel des Pechiez,› with such judicious omissions and excellent additions as made his version much more entertaining than the original. The purpose of the book was to convey religious instruction to the people in the agreeable form of moral anecdotes. It is of great importance from the linguistic point of view, as one of our best landmarks in the transition from the early to the later Middle English. He also made a new version in octosyllabic rhyme of Wace's ‹Brut d'Angleterre,› and added to it a popular translation of the French rhyming chronicle of Peter Langtoft of Bridlington. Robert deliberately wrote in English instead of French, in order to reach the common people, to give them the means "for to haf solace and gamen, in felauschip when tha sit samen (together)." See Handlynge Synne.

BRUNNOW, broo'nŏff, **Philipp** (Count von), Russian diplomatist: b. Dresden, 31 Aug. 1797; d. Darmstadt, 12 April 1875. He entered the Russian service in 1818. He was present in a civil capacity in the campaigns of 1828 and 1829 against the Turks, and in 1839 was sent on a special mission to London, where, in the following spring, he was accredited as permanent ambassador. In this capacity he soon acquired distinction as a diplomatist. After retiring from London on the outbreak of the Crimean War, in 1854, he represented Russia in Frankfort, and, together with Count Orloff, was sent to the Conference of Paris in 1856. He was afterward appointed to the court of Prussia; but in 1858 he returned to his old place in London, where he represented Russia at the conferences in 1864 and 1871. He was raised to the rank of count in 1871, and in 1874 retired to Darmstadt.

BRUNO, broo'nō, **Giordano,** Italian philosopher: b. Nola, Naples, about 1550; d. Rome, 16 Feb. 1600. He entered the order of Dominicans and became distinguished by the originality and poetical boldness of his speculations. In 1580, probably on account of the persecutions which he drew upon himself by his religious doubts and his satires on the monks, he was forced to take refuge at Geneva. Here, however, he was soon persecuted by the Calvinists for his paradoxes and his violence. In 1583 he stood forth at Paris as the antagonist of the Aristotelian philosophy, and as teacher of the *ars Lulliana.* His disputes with the Aristotelians caused him to leave Paris, and he then went to London, where he published several of his works, and to Oxford, where he taught for a short time. In 1585 he went by way of Paris and Marburg to Wittenberg, and from 1586 to 1588 taught his philosophy there. He then went to Helmstadt, where, protected by Duke Julius of Wolfenbüttel, he remained till 1589. He was then engaged at Frankfort-on-the-Main with the publication of some works, particularly ‹De Monade, Numero, et Figura,› but left this city in 1592, and returned to Italy. He remained peacefully in Padua until 1598, when the inquisition of Venice arrested him and transferred him to Rome. After an imprisonment of six years, that he might have opportunity to retract his doctrines, he was burned for apostasy, heresy and violation of his monastic vows. This death, which he might have averted eight days before by a recantation, he suffered with fortitude. While his violent attacks on the prevailing doctrines of the Aristotelian philosophy, and on the narrow-minded Aristotelians themselves, everywhere created him enemies, his rashness and pride threw him into the hands of his executioners. A monument was erected in 1889 on the spot where he was burned at the stake. His philosophical writings, which have become very rare, display a classical cultivation of mind, a deep insight into the spirit of ancient philosophy, wit and satire, as well as a profound knowledge of mathematics and natural philosophy. In 1585 appeared at Paris his famous ‹Spaccio della Bestia Trionfante› (a moral allegory, with many satirical strokes on his own times); also his work ‹Della Causa, Principio ed Uno› (Venice and London 1584); besides ‹Del Infinito, Universo, e Mondi.› The former contains the foundation, the latter the application of metaphysics to the natural world. The doctrine is a pure Pantheism, connected with very peculiar notions of God — *Deus est monadum monas, nempe entium entitas* — a more complete Pantheistical system than had been previously exhibited, and which, since his time, Spinoza only — who, like Descartes, borrowed his ideas — has reduced to a more systematic form. The notion that God is the soul of the universe, and the world endowed with organization and life, might have been forgiven by his contemporaries; but his inference that the world is infinite and immeasurable, and his doctrine of the plurality of worlds, at the moment when the new system of Copernicus was attacked from all quarters, could not but be looked upon as a crime. His writings are mostly in the form of dialogues, without any methodical order. His language is a strange mixture of Italian and Latin. His style is violent and fiery. The originality and loftiness of his ideas take a powerful hold on those who can understand him. His logical writings, in which he boldly and skilfully applies Raymond Lully's art of topical memory, are more obscure and less interesting. His belief in magic and astrology, notwithstanding his enlightened views of the nature of things, is to be attributed to the spirit of his age. He also wrote poems, among others, ‹Degli Eroici Furori,› and a satirical comedy, ‹Il Candelajo.› A collection of his Italian works by Wagner appeared at Leipzig in 1830, and another edition by Lagarde was issued at Göttingen (1888). His Latin works were issued in Florence and Naples (1879–81). Consult Rand, ‹Modern Classical Philosophers› (Boston 1908), in which a part of ‹Della Causa, Principio, ed Uno› appears in an English translation by J. Royce. A biography by Domenico Berti (Florence 1868) is of special interest and importance on account of the new papers it brings to light regarding the official examination of Bruno before the Inquisition of Venice.

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BRUNO, Saint, the name of two saints of the Roman Catholic Church. (1) The apostle of Prussia: b. about 970; d. 1009. He entered the order of Saint Benedict and accompanied Saint Adalbert on his mission to Prussia. He was appointed chaplain to the Emperor, Henry II, and was a zealous missionary in Poland, Russia and Hungary. Having been taken by the pagans of Lithuania, he had his hands and feet cut off, and was afterward beheaded. (2) The founder of the Carthusian order: b. Cologne about 1030; d. Della Torre, Calabria, 1101. He was educated in the school of the collegiate church of Saint Cunibert, in which he afterward received a canonship, and then studied at Rheims, where he so distinguished himself that Bishop Gervais appointed him to superintend all the schools of the district. He attracted many distinguished scholars, and among others Odo, afterward Pope Urban II. Subsequently he was offered the bishopric of Rheims, but the immorality of his times induced him to go into solitude. In 1084 or 1086 he repaired with six friends of a like disposition to a narrow, bleak valley, called Chartreuse (now known as La Grande Chartreuse) about 15 miles from Grenoble, where they built an oratory and separate cells, keeping silence six days of the week and only seeing each other on Sundays, and founded one of the severest orders of monks, named from their location Carthusians. In the meantime Urban II became Pope, and in 1089 invited his former instructor to his court. Bruno reluctantly obeyed, but refused every spiritual dignity, and in 1094 received permission to found a second Carthusian establishment in the solitude of Della Torre, in Calabria, where he died. Leo X, by whom he was beatified, in 1514, permitted the Carthusians to celebrate a mass in honor of him; and Gregory XV, who ordered the process of his canonization, in 1623 extended it to the whole Roman Catholic Church.

BRUNO THE GREAT, German ecclesiastic: b. 925; d. Rheims, 11 Oct. 965. He was the third son of Henry the Fowler, and brother of the Emperor Otho I. He had a great share in the events of his time, and surpassed all the contemporary bishops in knowledge and liberality of mind, combined with earnest piety. He was made archbishop of Cologne in 953, and Duke of Lorraine in 954, and had much trouble in bringing into due subjection his unruly subjects. Commentaries on the five books of Moses, and the biographies of some saints, are ascribed to him.

BRUNONIAN THEORY, an hypothesis framed by Dr. John Brown, 1735–88 (q.v.), according to which the living system was regarded as an organized machine endowed with excitability, kept up by a variety of external or internal stimuli, that excitability constituting life. Diseases were divided into sthenic or asthenic, the former from accumulated and the latter from exhausted excitability. Darwin, author of the ‹Zoonomia,› adopted the theory with enthusiasm, and Rasori introduced it into Italy, where it flourished for a time, and then had to be abandoned, as it ultimately was everywhere.

BRUNSWICK, Ferdinand, Duke of, German soldier: b. Wolfenbüttel, 11 Jan. 1721; d. Brunswick, 3 July 1792. He was the fourth son of Duke Ferdinand Albert, and was educated for the military profession. In 1739 he entered the Prussian service, was engaged in the Silesian wars and became one of the most eminent generals in the Seven Years' War (q.v.). He commanded the allied army in Westphalia, where, always opposed to superior forces, he displayed superior talents. He drove the French from Lower Saxony, Hesse and Westphalia, and was victorious in the two great battles of Crefeld and Minden. After the peace he resigned his commission on account of a misunderstanding with the King. From that time he lived at Brunswick, the patron of art and literature.

BRUNSWICK, Friedrich Wilhelm, Duke of, German soldier: b. 9 Oct. 1771; d. Quatre Bras, 16 June 1815. He was the fourth and youngest son of Duke Karl Wilhelm Ferdinand of Brunswick (q.v.). He was educated for the army, and in 1786 was appointed by the King of Prussia successor of his uncle, Frederick Augustus, Duke of Oels and Bernstadt. He then went to Lausanne, remained two years in Switzerland, and upon his return was made captain in a Prussian regiment of foot. During the war against France in 1792 and the following year he fought in the Prussian armies and was twice wounded. In 1806 he took part in the war against France with all the fire which the oppression of Germany and his father's unhappy fate had kindled in him. He finally joined the corps of Blücher, and was made prisoner with him at Lübeck. On the death of his eldest brother he would have succeeded to the dukedom, as his other brothers were incapacitated by disease, but Napoleon prohibited his succession. He raised a free corps in Bohemia to operate against the French, but though he gained a victory over 4,000 Westphalians he was unable to make an effectual stand on the Continent. He embarked his troops for England, landed in 1809 and was received with enthusiasm. His corps immediately entered the British service, and was afterward employed in Portugal and Spain. The Parliament granted him a pension of £6,000 until he returned to his hereditary dominions, 22 Dec. 1813. The events of 1815 called him again to arms and he fell at Quatre Bras.

BRUNSWICK, House of, a royal German house, the true founder of which was Albert Azo II, Marquis of Reggio and Modena, a descendant, by the female line, of Charlemagne, who had also extensive domains in Lombardy, and in 1047 married Cunigunda, heiress of the counts of Altorf, and thus united the two houses of Este and Guelph. The previous history of the Este family is uncertain. Guelph, the son of Azo, was created Duke of Bavaria, in 1071. He married Judith of Flanders, who was descended from Alfred the Great of England. The most powerful of this line was Henry the Proud, who succeeded in 1125, and by his marriage with the daughter of Lotharius II acquired Brunswick and Saxony. Brunswick ultimately fell to a younger branch of the family, and Otho, the great-grandson of Henry by this branch, was the first who bore the title of Duke of Brunswick (1235). John, eldest son of Otho, founded the house of Lüneburg. Albert the Great, a younger son of Otho, conquered Wolfenbüttel, and on his death (1278) his three sons divided his dominions. Henry founded the house of Grubenhagen, Albert became Duke of Brunswick and William Duke of Brunswick-Wolfenbüttel. Henry Julius, of this last branch, inherited Grubenhagen (1596). Ernst of Zell, of the second branch, who succeeded (1532), conquered the territories of Wolfenbüttel, and left two sons, by whom the family was divided into the two branches of Brunswick-Wolfenbüttel (II) or Brunswick-Lüneburg, and Brunswick-Hanover, from the latter of which comes the present royal family of Great Britain. The former was the German family in possession of the duchy of Brunswick down to 1884, when this line became extinct on the death of the last duke, Wilhelm I, who ascended the throne of the duchy in 1831. Ernst Augustus, of the Brunswick-Hanover house, was created Elector of Hanover in 1692. He married Sophia, daughter of Elizabeth, the daughter of James I of England. Their son George succeeded his father as Elector of Hanover in 1698, and was called to the throne of Great Britain as George I in 1714, under the Act of Settlement of 1701, which invested the succession in the heirs of the Princess Sophia, being Protestants. The British sovereigns continued to rule Hanover till the accession of Victoria, when the Duke of Cumberland succeeded. The present Duke of Cumberland, titular Duke of Brunswick and King of Hanover, would have become ruler of Brunswick but for the events which transferred Hanover to Prussia; and Prince Albert of Prussia was elected regent of Brunswick instead. On the latter's death in 1906, the Duke of Cumberland proposed the renunciation of the throne for himself and his eldest son, on condition that Ernst August, his second son, should succeed. The offer was not accepted and the Duke of Mecklenberg became Regent. In 1913 Ernst August married the daughter of Wilhelm II, Emperor of Germany, and Brunswick was given him on condition of his renouncing all claims to Hanover. Consult Fitzmaurice, 'Charles William Ferdinand, Duke of Brunswick' (London 1901) and Heinemann, 'Geschichte von Braunschweig und Hanover' (Gotha 1882–92); Knoll und Bode, 'Das Herzogthum Braunschweig' (1897).

BRUNSWICK, Ga., city and county-seat of Glynn County, situated on Saint Simon's Sound, eight miles from the Atlantic Ocean, on the Plant System and the Southern Railway, 80 miles south-southwest of Savannah. Its settlement dates back more than 100 years, and its importance as a commercial port has been developed since the close of the Civil War. It has an admirable and spacious harbor, provided with a brick lighthouse; is connected with New York, Fernandina and Savannah by regular steamship lines; and exports large quantities of cotton, phosphates, tar, turpentine and pine lumber. Truck gardening, fishing and oyster and vegetable canning are important industries, and there are box, handle, cigar and carriage factories, machine shops, foundries, lumber mills, and bottling, copper and cement-stone works. There is also a large turpentine and rosin refinery having a capacity of 700,000 gallons of turpentine and 108,000 barrels of rosin a year. The city is the seat of a United States marine hospital and is a popular summer and winter resort, with fine hotels. Brunswick was settled as early as 1735 by James Oglethorpe. Pop. 10,182.

BRUNSWICK (Ger., BRAUNSCHWEIG), Germany, a republic and free state in the northwest part of the German empire, comprising an area of 1,425 square miles. It is divided into eight districts — three larger and five smaller, detached from each other and surrounded by foreign possessions. The minerals are of some importance, including iron, lead, copper, some gold and silver, salt, asphalt, peat; while there are also marble, granite, sandstone and other kinds of stone. The forests cover a considerable area, and over 72 per cent of this is in the hands of the state. About one-half of the land is arable. Of the cultivated area of Brunswick 75 per cent belongs to private persons, 14 per cent to corporations and 11 per cent to the state. The most important cultivated crops are grain, flax, hops, tobacco, potatoes, the sugar-beet and fruit. A good deal of attention has been given in recent times to the improvement of the breeds of cattle, sheep and horses. The industrial occupations are varied if not individually important, and embrace beetroot sugar, tobacco and cigars, paper, glass, flax, jute and woolen goods, hats, wooden wares, chemicals, porcelain, sewing and other machines, lacquered wares, sal-ammoniac, chicory and madder industries. The lacquered wares and porcelain of Brunswick are famous even in foreign countries. Brunswick, the capital, is the centre of trade. In 1806 the duchy was annexed by Napoleon to the kingdom of Westphalia, but its native prince, Frederick William, was restored in 1813. In the German Confederation Brunswick held the 13th rank, with two votes in the Assembly and one along with Nassau in the Diet. It was afterward a member of the North German Union, formed after the dissolution of the old confederation by the victories of Prussia in the short campaign of 1866. As a state of the German empire it now sends two members to the Bundesrath and three deputies to the Reichstag. In its internal government Brunswick is a constitutional monarchy. As amended in 1899, the constitution provides for a Diet of one chamber, composed of 48 members, 15 elected by the towns, 15 by the rural communities, 2 by the Protestant clergy, 4 by the landed aristocracy, 3 by the manufacturing interests, 4 by the professional classes and 5 by the highest taxed citizens. The estimated revenue and expenditure for 1912–13 were respectively 14,964,413 marks and 14,961,518 marks; the debt, 45,173,991 marks; reserve fund, 37,644,003 marks. Education is in the hands of a special commission. There are about 439 elementary schools, and a considerable number of secondary and trade schools. In 1910 the population was 494,339. The prevailing religion is the Lutheran.

BRUNSWICK, Md., town in Frederick County, 45 miles northwest of Washington, D. C., on the Chesapeake and Ohio Canal, the Potomac River and on the Baltimore and Ohio Railroad. It contains a casket factory and railroad shops. The government is vested in a mayor and council of six, chosen for terms of one year. The waterworks are the property of the municipality. Pop. (1920) 3,905.

BRUNSWICK, Me., a town in Cumberland County, situated on the right bank of the Androscoggin, 26 miles northeast of Portland, on the Maine Central Railroad. The falls of the Androscoggin afford excellent power for several pulp, paper and cotton mills and other manufactories. Bowdoin College (q.v.) is located here, and connected with it is the Medical School of Maine, established in 1820. Brunswick, originally called Pejepscot, was settled in 1628. Pop. (1920) 7,261.

BRUNSWICK BLACK, a quick-drying varnish, made of turpentine, asphaltum and linseed oil. It is used as a lacquer for roughly coating finished iron work, and also in the preparation of microscopic slides.

BRUNSWICK GREEN, a green pigment, prepared by exposing copper turnings to the action of hydrochloric acid in the open air. It is a pale bluish-green, insoluble, cupric oxychloride, $CuCl_2.3CuO.4H_2O$. It derives its name from Brunswick, Germany, where it was first made by Gravenhorst.

BRUNSWICK-LUNEBURG, Karl Wilhelm Ferdinand, Duke of, German soldier: b. (eldest son of Duke Charles of Brunswick, and of a sister of Frederick the Great) 9 Oct. 1735; d. Ottensen, near Altona, 10 Nov. 1806. He was carefully educated, and his military ambition was early kindled by the achievements of Frederick II. He commanded the Brunswick troops in the allied army in the Seven Years' War, and in the fatal battle at Hastenbeck, 28 July 1757, he recaptured a battery that had been taken by the French, calling forth from Frederick a statement that «he showed that nature had destined him for a hero.» He was instrumental in deciding the victory of Crefeld. He took the most active part in all the enterprises of his uncle Ferdinand; and Frederick's esteem for him continued to increase. In 1764 he married the Princess Augusta of England. He practised the greatest economy, living mostly retired from public business, and devoted to the arts and sciences. In 1773 he entered the Prussian service and became general of infantry, but had no opportunity of displaying his military talents. After the death of his father (1780) he entered upon the government with zeal and activity. Anxious for the improvement of the finances, he diminished his household, discharged the debts of the state, encouraged agriculture, extended the liberty of commerce, undertook or assisted in the erection of considerable buildings, and by causing Italian operas, masquerades, etc., to be exhibited gratis, provided also for the amusement of the public. Yet, with the best intentions, he was often unsuccessful. This was the case with his plans for the improvement of public education. He invited men of learning into the country at great expense, but the projected reformation having met with innumerable obstacles, they became a burden to the state. In 1787 he commanded a Prussian army for the support of the Stadtholder of Holland. When the wars of the French Revolution broke out, he received the chief command of the Austrian and Prussian army, and issued at Coblenz, 15 July 1792, a manifesto, drawn up in a very haughty style, which did more injury to the allied forces than a hostile army could have done. The Duke planned to press forward from Lorraine to Paris to cut off its supplies, and thus force it to surrender by famine. Longwy was taken 23 August and Verdun 2 Sept. 1792. But in Champagne, an unproductive country, the transport of provisions for the army from the frontiers was rendered difficult by mountains and forests. Dumouriez was encamped in the vicinity of Saint Menehould, and skirmishes took place daily; but the skilful dispositions of Dumouriez culminated in the defeat of the Germans by Kellermann at Valmy, 20 Sept. 1792, and Brunswick-Lüneburg was obliged to conclude an armistice and evacuate Champagne. Custines took Worms and Spires during this retreat, and captured the fortress of Mainz, 21 October, and soon afterward Frankfort, which latter city, however, was retaken by the Prussians and Hessians, 2 December. The endeavors of the Germans, therefore, were principally directed to the recapture of those places.

To this end the Duke, in conjunction with the Austrians, opened the campaign on the upper Rhine, in 1793, took the fortress of Königstein 7 March, reconquered Mainz, 22 July, and prepared to attack the strong fortress of Landau, then in the power of the French. The French, on the other hand, 14 September, made a general attack on the Duke of Wurmser, from Strassburg to Saarbruck. On that day the Duke had a sanguinary engagement with Moreau in the vicinity of Pirmasens, a town belonging to the landgraviate of Hesse-Darmstadt. The French were driven from their camp near the village of Hornbach as far as the Saar. A month later the Duke, having formed a union with Wurmser, succeeded, 13 October, in his attack on the lines of Weissenburg and his attempt to draw nearer to Landau. In order to gain another strong point of support, he ventured, on the night of 16 November, to make an assault upon the mountain-fortress of Bitche, which is the key of the Vosges, as the roads from Landau, Pirmasens, Weissenburg and Strassburg unite at that place. This attempt miscarried. Between the 28th and the 30th of November, however, he defeated a division of the Army of the Moselle at Lautern, which was pressing through the mountains under the command of Hoche, with the intention of relieving Landau. But the daily attacks of Hoche and Pichegru, without regard to the sacrifice of men, and the successful attempt of the latter to break the Austrian lines near Frœschweiler, 22 December, forced the Austrians to retreat beyond the Rhine, and occasioned the retreat of the Duke also. As some difficulties had already arisen between Austria and Prussia, he laid down the chief command of the army in the beginning of the year 1794. The Duke continued to labor for the welfare of his country until 1806. Although now of such an age that he might have retired without reproach from public life, yet he assumed burdens beyond his powers. At the beginning of the year 1806, commissioned by the King of Prussia, he made a journey to Saint Petersburg relative to the war that soon broke out with France. He was then placed at the head of the Prussian army. But his physical strength was not equal to his moral energy, as was proved by the battles of Jena and Auerstädt, in the latter of which he was mortally wounded. Napoleon included his duchy in the kingdom of Westphalia in 1806, but it was afterward restored to his son Frederick William. The latter lost his life at the battle of Quatre-Bras in 1815. His son Charles Frederick came of age in 1823 and succeeded to the dukedom (George IV of England having acted as Prince Regent during his minority) but he was driven from the duchy by a revolt in 1830. His brother William then assumed the government, ruling until 1884.

BRUNTON, Mary (Balfour), Scotch novelist: b. Burra Island, in the Orkneys, 1778; d. 1818. In her 20th year she married Dr. Alexander Brunton, minister at Bolton, near Haddington; afterward at Edinburgh. She wrote ‘Discipline’ and ‘Self-Control,’ two novels which met with favor. At her death she left ‘Emmeline,’ a tale, and other pieces, which were published by Dr. Brunton, with a biographical sketch.

BRUSH, Charles Francis, American inventor: b. Euclid, Ohio, 17 March 1849. He received his early education in the public schools of Cleveland, Ohio, and was graduated from the high school of that city. At an early age he developed a liking and aptitude for scientific studies and, entering the University of Michigan, was graduated therefrom in 1869 with the degree of mining engineer. From the same university he received the honorary degrees of M.S. in 1899 and Sc.D. in 1912. The honorary degree of Ph.D. was conferred upon him in 1880 by the Western Reserve University, and that of LL.D. in 1900 by the same institution, and also, in 1903, by Kenyon College. He was an analytical chemist in Cleveland 1870–73. From 1873 to 1877 he was engaged in the iron-ore and pig-iron industry. Throughout this period, however, he carried on and made great progress with his investigations and experiments in practical electricity. He perfected, in 1876, the dynamo-electric machine known by his name, and not long after the «series» arc lamp, which might with uniform results be used in circuit in large numbers. Since that time he has patented more than 50 other inventions, chiefly detailed improvements on the two preceding. He founded in Cleveland, in 1880, the Brush Electric Company, which controlled his American patents. In 1891 Mr. Brush withdrew to a great extent from active business affairs but has since continued to maintain a laboratory at his home, where he carries on his scientific pursuits. In 1881 he was decorated by the government of France a chevalier of the Legion of Honor, in recognition of his discoveries in electricity. In 1899 the American Academy of Arts and Sciences awarded him the Rumford medal for «the practical development of electric arc lighting.» In 1913 the American Institute of Electrical Engineers awarded him the Edison medal. He has contributed many important papers to scientific societies and publications, embodying the results of his investigations.

BRUSH, Edward Nathaniel, American physician: b. Glenwood, Erie County, N. Y., 23 April 1852. He was educated at public and private schools in Buffalo, received degree of M.D. from medical department of the University of Buffalo, edited the *Buffalo Medical Journal* (1874–79, and was assistant in the State Lunatic Asylum at Utica (1878–84) and in the Pennsylvania Hospital for the Insane at Philadelphia (1884–91). In the year last named he became physician-in-chief of the Shepard and Enoch Pratt Hospital, Baltimore. He has written much upon the subject of insanity and was associate editor of the *American Journal of Insanity* (1878–84), and is now managing editor. He is now professor of psychiatry at the University of Maryland Medical School, is president of the American Medico-Psychological Association and the Mental Hygienic Society of Maryland.

BRUSH, George De Forest, American artist: b. Shelbyville, Tenn., 28 Sept. 1855. He studied under Gérôme in Paris and first attracted attention by his pictures of Indian life. His later work is almost entirely figure composition. He exhibited ‘The Artist’ and ‘Mother and Child’ at the Paris exhibition of 1900, and received its gold medal. His later works are owned by the principal museums — the Metropolitan Museum, New York; the Boston Art

Museum; the Carnegie Art Gallery, Pittsburgh; the Corcoran Gallery, Washington; the Penn Academy, Philadelphia; the Chicago Art Institute — and are also found in private collections. He is academician of the National Academy of Design and member of the Academy of Arts and Letters.

BRUSH, George Jarvis, American mineralogist: b. Brooklyn, N. Y., 1 Dec. 1831; d. 1912. He received a public school education and was graduated at Yale, where he studied science, in 1852. He subsequently studied in Germany. From 1855 he held professorships at Yale — that of metallurgy down to 1864, and that of mineralogy after that date. He was long a leading official of the Sheffield Scientific School. His writings on mineralogy are authoritative.

BRUSH, an instrument used for painting, or for removing dirt by light rubbing, from floors, furniture, etc. Brushes are generally made of hair, bristles, whalebone or of various vegetable fibre and are divided into two classes — simple and compound. Simple brushes are composed of a single tuft and compound brushes consist of several tufts inserted in a handle. Painters' brushes are examples of the former and ordinary hair brushes of the latter.

BRUSH-GRASS (*Andropogon gryllus*), a grass of South Europe, with stiff wiry roots which are used for making brushes.

BRUSH-TURKEY, a mound-building game-bird of Australia, *Catheturus lathami*. See MEGAPODES.

BRUSHES AND BROOMS. Brushes are implements used for two distinct purposes: (1) The sweeping or whisking away of dust and dirt, and (2) the laying on of liquids in thin layers, as in painting. Brooms, in general, are brushes with longer handles; the whisk-broom, or whisk, is a little broom with a short handle. Brushes are made of many kinds of material, to suit the many purposes for which they are used. Some of these are bristles, rice root, bass, Tampico (grass), Jaumave (istle), palma fibre, bristle fibre or coir (cocoanut husk), broom corn, rushes, rattan (split), bamboo (fibre), oiled kitool (a wood fibre), rubber, wire of brass, steel and German silver; the hair of the camel, cow, horse, goat, squirrel, sable and bear; feathers, and whalebone.

Notwithstanding the great variety of possible material, about 92 per cent of all brushes are made from the bristles of the hog. The best quality comes from Russia and China, where certain breeds of hogs are raised especially for their black bristles and, in some sections, not for eating. The Russian bristles are most highly esteemed. They are from 3½ to 7 inches in length. The Chinese bristles are from 2½ to 7 inches long. A considerable part of the supply of bristles on the market comes from France and Germany, and these bristles are white, yellowish or bleached and vary in length from 2 to nearly 5 inches in length. In the year ending 30 June 1915, the United States imported 4,062,060 pounds of bristles (valued at $3,613,084), of which 2,400,000 pounds came from China. In order to get enough to supply their needs, the larger brush-houses keep employees at the great packing-houses to collect the better quality of bristles from the hogs as they are slaughtered.

Except in the largest plants, the brush-making industry consists in assembling parts made elsewhere in specializing factories. The handles are made in one place and finished in another. The bored blocks are made in still other factories. Twine, broom nails and staples, plush and metal bands, caps for whisks — each has its specialized trade. One concern specializes in badger hair, and every sort of brush material has its particular importing and trade houses.

Brushes have been classified as simple and compound — in the first class those composed of a single tuft of brush material; in the second class those made up of a number of tufts. The first class comprises the brushes made for the use of artists and painters and the «hair pencils» used in medicine for the outward application of certain remedies, as, for example, the tincture of iodine. Some painters' brushes made for roof painting are compound, or perhaps, more exactly, are formed of a single rank of simple brushes.

For painters' brushes no material has been found acceptable but the bristles of the hog, which have a fag or split end tending to hold the paint. Several different lengths of bristles are used in each brush, so that as the brush wears down there are always new tips at the end to keep the brush in good working order. The bristles are gathered in a tuft of the required size and set into a socket in the handle with some kind of cement, the kind of cement depending upon the use to be made of the finished brush; if in alcohol varnishes, they are set with glue; if in water solutions, thev are set with a cement whose solvent is alcohol or benzine. The problem of the brush makers is to find some cement which will resist the dissolving action of all the common solvents in use — water, oils, alcohol, turpentine, petroleum spirit and the like. A comparatively recent improvement has been the setting of the bristles with rubber (paste) and then vulcanizing the rubber. This is successful with small brushes, particularly the flat varnishing brushes, but the great heat required destroys the liveliness or elasticity of the bristles, and, besides, the process is slow, consuming several days. It is entirely useless for large brushes.

Fibre brushes are of many sorts and the materials are drawn from all parts of the world. The «rice root» fibre comes from Mexico, and so does the «Mexican grass,» of which other cheap brushes are made. Another material much used is «kitool,» a wood fibre boiled in oil, coming from the west coast of Africa. Tampico fibre comes from the Philippines. The fibre brushes are mostly of the compound type. The wood blocks in which the tufts of fibre are set come from the wooded sections of Pennsylvania and Maine. The first operation is boring the holes in the blocks. The bunches of fibre of the proper size to fill the holes are dipped at one end into pitch, pressed into the holes and given a little twist. The operatives are mostly girls, and each will set about 2,000 tufts a day. There are 41 holes in a scrubbing brush and 125 in a fine floor brush. Another method of setting the fibres (used also in making bristle brushes) is to catch a loop of wire coming down through the hole in the block at the middle of a tuft, and then to draw the wire up tight into the block, without using pitch. The brush is clipped into perfect shape almost instantly in a machine having many adjustable knives. Backs are glued on or molded on with composition and generally finished with varnish. Many brushes are made on the Woodbury machine, but the great bulk of the work is still done by hand. The Woodbury machine makes what is called a "trepanned" brush; the holes are not bored through the block, but only so deep that they may meet other holes bored from the sides and ends. These holes are afterward plugged and the back is finished on the original block.

In making the common household broom, the material used is broom corn, a variety of sorghum grown extensively in the Mississippi Valley and particularly in Kansas and Oklahoma. The broom corn is graded, the rougher portions, called "underworking," being tied (with wire) first around the foot of the handle; the medium quality, called "self-working," next, and then the outer layer of the best quality, called "hurl." The broom thus formed is conical. It is given its usual flattened shape by squeezing it in a vise and, while thus held, sewing it through and through with twine. A special broom for heavy use has a metal band placed around it while in the vise, and is sewn with wire through the band, the handle being brought down low enough to be circled with this wire stitching. A recent introduction is the "knock-down broom," which is made on a short stick with a socket for the handle, the idea being to renew the broom, when worn out, without the cost of a new handle which practically never wears out.

According to the census of 1909, there were in that year in the United States 1,282 establishments making brushes and brooms, employing 12,153 hands and a capital of $18,982,000 The value of the output was $29,125,596, of which $11,547,326 represented the value added by manufacture. In the year ending 30 June 1915, the United States imported feather dusters and hair pencils to the value of $1,644,189.

BRUSILOFF, broo-si-lof, or **BRUSILOV, Alexei Alexeievitch**, Russian general: b. Kutais, Russian Caucasus, 1853. The descendant of an old noble family, he spent his youth in his birthplace, half-way between Poti on the Black Sea and the ice-capped Mount Kazbek, and was educated in Tiflis. Trained to horsemanship from childhood, he began his military career as a sub-lieutenant in the cavalry and speedily distinguished himself as one of the champion riders of the country. At the age of 24 he served in the Russo-Turkish War of 1877–78; rising steadily through the various ranks, he was appointed commander of the 2d Cavalry Division of the Guard in 1906, and played a prominent part in developing and perfecting that branch of the army. For some time he acted as military assistant to the governor-general of Warsaw. In 1911, he was placed in command of an army corps in Podolia. It was there, on the borders of eastern Galicia, that he was stationed when the European War broke out in 1914, and whence he invaded Galicia. He was offered a high command in the early stages of the War, but declined on the ground that he wished "to perfect his great scheme." The thrilling story of the invasion of Galicia and the ensuing campaign is told elsewhere in these volumes.

General Brusiloff was given the command of the 8th Russian Army on the Carpathian front in April 1915, just before General von Mackensen opened his terrific drive against the Dunajec-Biala line and reconquered Galicia. In the disastrous Russian retreat that followed it was the skill and resourcefulness of Brusiloff alone that enabled the Russians, who were trapped in the passes, to extricate themselves from the grip of von Mackensen's "phalanx." His remarkable rearguard actions made his defeat appear rather like a victory. Being short of artillery, Brusiloff reversed the usual military practice of covering retreat with guns and finally sacrificing them to the pursuing enemy. Instead, he left strong detachments of infantry behind and saved his guns for future service. At a later stage — on the Styr — he fought a desperate battle lasting nearly two months against the Austro-German forces under General von Linsingen. Brusiloff succeeded General Ivanoff as commander of the southwestern group of armies in April 1916. His first task was to send the war correspondents home again. To their expostulations he replied, "Not a word, not a line of my movements shall go hence; if you want to known what we are doing, read the Vienna dispatches. . . . I have no intention of having my movements sent to Berlin over the Petrograd switchboard." Under his command great victories, won in three days (June 1916), in the offensive against the Teutonic forces which developed in Volhynia, Galicia and Bukowina, were announced. Strongly fortified positions were carried by bayonet charges; entire batteries were seized, over 40,000 prisoners taken, besides huge stores of booty.

After the fall of the house of Romanoff in the revolution of 1917, Brusiloff's main preoccupation was to maintain discipline in the army and to prosecute the war with increased energy. The ensuing political chaos and military insubordination were strongly against him. He tendered his resignation in May 1917, which Kerensky refused to accept. In June 1917 he was appointed commander-in-chief of the Russian armies in succession to General Alexeieff (q.v.). A collection of phrases and military maxims, culled from his letters, interviews and private conversations, was published 10 June 1916.

BRUSSA, or **BROUSSA**, Asia Minor, a Turkish city, and capital of the vilayet of Khodavendikyar, situated in a fertile and finely wooded plain, which is enclosed by the ridges of Olympus, and abounds in hot, sulphurous and chalybeate springs, which are much frequented. A railway runs between Brussa and Mudania, its port on the Sea of Marmora. The inhabitants are Turks, Greeks, Armenians and Jews, engaged in commerce, in the culture of the vine and in the manufacture of carpets, gauze, etc. A considerable number of persons are employed in mulberry culture, the reeling of silk and silk manufacture, Brussa silks being in great demand throughout the Orient, though it sends much raw silk to Lyons to be manufactured. Caravans passing from Aleppo and Smyrna to Constantinople promote the commerce of the town. Before the earthquake of 1855 Brussa contained close upon 150 mosques, and was adorned with an immense number of fountains; but from the earthquake and a terrible conflagration the former splendor of the town suffered greatly. It is a picturesque and interesting place, however, gardens, groves and streams of running water being interspersed among the buildings. The castle, which is about a mile in circumference, is supposed to represent the Prusa of the ancients. Brussa was long the capital of Bithynia, and one of the most flourishing towns in the Greek empire of Constantinople. In 1326 it was taken by Orkhan, son of Othman, founder of the Ottoman dynasties; and from that epoch it was the residence of the Turkish sovereigns until the seat of empire was transferred to Adrianople. Pop. about 76,000.

BRUSSELS (Flem. BRUSSEL; Fr. BRUXELLES), capital of the province of Brabant, Belgium, and also of the country, is situated on the small river Senne, about 50 miles southeast of the German Ocean; lat. 50° 51′ N.; long. 4° 22′ E. Brussels is built partly on the acclivity of a hill, partly on a plain, in a country agreeably diversified by sloping heights. Like many other Continental towns whose political situation has changed, its old fortifications have been transformed into boulevards. These surround the older portion of the city, extending for nearly five miles; they are planted with elms and linden trees in four rows and form a wide and agreeable promenade, commanding an extensive view of the surrounding country. The numerous gates, most of which bear the names of the principal high roads or railways which traverse the kingdom, are nearly all modern, but the Porte de Hal, built in 1379, is a remnant of the ancient fortifications, a large military tower of remarkable construction, which in later days was long used as a prison. The city now extends far beyond the boulevards. The Senne enters it by two branches, a great part of one of these being now covered over. The stream is not navigable, but Brussels possesses water communication by means of canals with Charleroi, Mechlin, Antwerp and the ocean. In many quarters within the boulevards Brussels still presents a congery of twisted streets, but improvements since the beginning of the century, and a system of electric street railroads connecting with the suburbs, have done much to modernize and beautify the city. That part of the upper or new town inside the boulevards, which contains the royal palace, is the principal exception. The suburbs, outside the boulevards, especially in the upper town, have greatly increased. The principal are the Quartier Leopold and the Quartier Louise, which are regularly and elegantly built. The principal buildings of the new town are the King's palace, the palace of the chambers, the palace of justice (a magnificent new building of colossal proportions in the classical style), the palace of the fine arts, the public library and museum, etc. The upper town is ornamented with a fine park of 17 acres, with fountains and statues, around which most of the principal buildings are situated. The lower town is rich in ancient architecture. The Hôtel de Ville (built 1401–55), one of the finest municipal buildings in Belgium, is an imposing Gothic structure with a spire 364 feet high. The square in front of it is perhaps the most interesting of all the public places of Brussels. The cathedral of Saint Gudule is the finest of many fine churches, richly adorned with sculptures and paintings. It was founded in 1010, and its reconstruction, commenced in 1226, was carried on till the 17th century. The churches of Notre-Dame-de-la-Chapelle and Notre-Dame-des-Victoires are also edifices of great beauty. The monuments of Brussels, and the specimens of paintings and sculpture with which its public buildings are adorned, are too numerous to mention.

The manufactures and trade of Brussels are greatly promoted both by its canal communications and by the network of Belgian railways. Printing, type-founding and all the other departments of bookmaking give employment to a large section of the population. Lace was an ancient manufacture, and is still of importance; the printing cotton and woolen fabrics, muslins, etc., and many minor manufactures are carried on. Brussels carpets are chiefly made at Tournai, but some are manufactured in the city. There are breweries, distilleries, sugar refineries, foundries of iron and brass, steam engine factories, etc. The trade carried on by the canals and railways is that of a capital city and manufacturing town, for the supply of internal wants and the distribution of its own products. The languages spoken in Brussels are French and Flemish, or Dutch, the former principally spoken in the new town, the latter chiefly in the old. English is also spoken a good deal, owing to the number of English residents and visitors.

The scientific, literary, artistic and benevolent institutions of Brussels comprise a free university, founded in 1834, a proprietary institution, with four faculties, mathematical and physical sciences, *belles-lettres,* law and medicine; a school of geography, founded in 1830, with an extensive museum, embracing geology, chemistry and natural history; one of the finest observatories in Europe, the Belgian Royal Academy of Sciences, Letters and Fine Arts and the Royal Academy of Fine Arts; the public library, the picture gallery, with the finest specimens of Flemish art; the Royal School of Medicine; many institutions for elementary education; societies of horticulture and other natural sciences; several hospitals; an infirmary; a philanthropic society, etc.

During the Middle Ages Brussels did not attain the extent or importance of several other cities of the Low Countries. The Emperor Otho dated a decree from Brussels in 976. It was walled by Baldric, Count of Louvain, in 1044. It was more completely fortified in 1380, the wall then following nearly the line of the present boulevard. During the 15th century it was twice burned and once ravaged by the plague. It was the scene, in 1568, of the execution of Counts Egmont and Horn. It was bombarded and burned by the French in 1695, and was the headquarters of Marlborough after the battle of Ramilies. It was taken by the French in 1794, and retained till 1814, when it became the chief town of the department of the Dyle. From 1815 to 1830 it was one of the capitals of the kingdom of the Netherlands, and in 1830 it was the chief centre of the revolt which separated Belgium from Holland. Since then it has been the capital of the Belgian kingdom, and one of the centres of European civilization, being especially distinguished for the cultivation and patronage of art. International conferences were held at Brussels in 1874, 1876, 1889–90 and in 1902. An international exposition of great importance, held in 1910, was visited by 13,000,000 persons, but was marred by a disastrous fire which occasioned a loss of $10,000,000. Following the invasion during the great European War, Brussels was occupied by the Germans 20 Aug. 1914. The population of Brussels in 1911 was 177,078; including the suburbs, 728,910. The foreign element is prominent, especially the French.

BRUSSELS CONFERENCE, the current name of two abortive international conferences — one on the usages of war, July-August 1874; the second on bimetallism, in the autumn of 1892.

1. The harsh treatment of prisoners and non-combatants in the Franco-German War aroused a humane feeling in protest. At the Congress of Universal Alliance in Paris, June 1872, a Society for the Improvement of the Condition of Prisoners of War was formed, which sent a circular to the chief European powers asking them to appoint delegates to a congress on this subject at Paris. England and France declined, because the request came from no official source, but Russia substituted a project of her own, and Gortchakoff invited the powers to a conference at Brussels, ostensibly to lay before them a proposal for «a code to determine the laws and usages of warfare, and to limit the consequences and diminish the calamities consequent upon war, as far as it may be possible or desirable.» The pronunciamento accompanying the call set forth that war is a conflict between the armed and organized forces of the belligerents and operations of war must be directed exclusively against such armed forces and not against the non-combatant subjects of either belligerent state. However, by a further stipulation, the occupying army was to be allowed to levy taxes for its benefit, to seize not only all public property of the conquered government, but also all private property useful in carrying on the war or which interfered with the success of the military operations. A declaration that volunteers and militia were non-military inhabitants was also included, and it was claimed that they were liable to «military punishment» if they took arms. Further, it was declared that an army may exact «provisions, clothing, etc.,» necessary for its maintenance and levy money contributions either in case of need or as a penalty. The Russian project was characterized in England as an imposture and only one English delegate was sent — to register the dissent of his government. The United States sent none, and the South American states were refused any share. To the dismay of the promoters, the meeting was at once turned into an engine for the exact reverse of their intentions. The dominating force throughout was that of Germany and Russia, whose views and purposes were identical; and it soon became clear that the real object of the call was to strengthen their hands as militant states by throwing overboard the entire fabric of international law on the obligations of humanity and substituting the boldest assertion of the naked rights of irresponsible force. The foremost contention was that enemy goods in neutral ships were exempt from capture. This England construed as an attack upon her naval power. The original topic of prisoners of war, when brought up, was refused discussion by the Russian delegate, Jomini, on the ground that the governments did not wish to hamper themselves. The question of revising the articles of the Geneva Convention (q.v.) on the treatment of the sick and wounded, and the neutrality of clergymen, physicians, etc., attending them, was also thrown out by him, on the ground that for military reasons it was necessary to revise the whole convention and that the states «most apt in the initiative of war» should have the right to «insist on their necessities.» The question of what constitutes «effective occupation» was still more vital. The obvious interest of aggressive states was to insist, as did Germany, that it «need not manifest itself by visible signs,» so that a town once occupied should still be considered so even if the troops were removed and any rising of the inhabitants be punishable as treason, and that it was sufficiently established by «flying columns,» or, as defined by a satiric German, «three Uhlans and a trumpet.» This denial of all rights of self-defense against invasion was almost unanimously rejected by the other delegates, however, and the principle substituted that there must be actual occupation by adequate force and lines of communication kept open; that it «exists only when the territory is placed actually under authority of the hostile army, extends only to the territory where such authority is established and exists only so long as the belligerent is able to exercise it.» The right of *levee en masse,* or armed insurrection of the body of a people, is linked with this; and naturally the states itching for conquest wished to confine belligerent rights to regularly enrolled armies and oblige the rest of the people to submit when these are defeated. Of course no such rule adopted by the belligerents themselves would ever bind a people who wanted to rise, but it would form a plea for much political murder before it was repealed. Jomini said that war had so changed its nature in modern times that it was necessary to «regulate the inspirations of patriotism,» for fear they might be «more disastrous to the country itself than to the oppressor,» and that «those grand explosions of patriotism which took place in the beginning of the century cannot continue to occur in our day, at least not in the same form.» On this head it was proposed that any inhabitant of a country under occupation who should give information to the «enemy» (his own people) should be handed over to «justice.» But this philanthropic repression of self-defense in its own interest and outlawry of the means by which Prussia gained her own independence was not agreed to. All these assaults on natural right were opposed by the British delegate. An attempt was made to discuss reprisals or retaliation, but it was refused. Restriction of bombardment of the interior of towns without harming the fortifications was sought but flatly refused by Germany and Russia, on the ground that «experience had shown it (the bombardment) to be one of the most efficient means

of securing the objects of a war," which is true of sack, massacre and other things banned by civilization. Finally a proposal was made that, at the option of the belligerent, neutrals should be obliged to receive and care for (at the belligerent's expense) the wounded; in other words, that a strong power could make its neutral neighbors depots to keep its armies in condition.

2. The change in relations between gold and silver, which has produced so much financial and political demoralization in the last quarter of the 19th century, was the subject of three international conferences within that time — at Paris, August 1878 and April 1881, and at Brussels, November 1892. The last named was called by President Harrison for both business and political reasons. The accumulation of silver under the Sherman Act of 1890 was threatening the country with a fall to the single silver standard and was only averted by the bond sales of 1893 and the repeal of the act; and the free-coinage movement which convulsed the country in 1896 was making headway, had been approved by the platform on which Harrison was elected and demanded some recognition. Abroad, the recent adoption of the gold standard by state after state was raising gold to a premium and arousing the fear that it was too scarce to be the sole money of ultimate payment; the fall in silver was causing much loss and dislocation of trade, and many believed that its demonetization was the sole cause of this and of the low price of commodities (which they called the high price of gold), and that its restoration by common agreement would raise its price again and restore equilibrium of commerce. The call was accepted by all the European states and Mexico, with the United States, 20 in number; and all the 50 delegates were present, but those of Germany, Austria and Russia were forbidden to debate or vote. The president was Montefiore Levi, of Belgium; its vice-president, Edwin H. Terrell, United States Minister to Belgium. The United States delegation drew up the order of business, and offered a resolution that "it is desirable that some means should be found for increasing the use of silver in the currency systems of the nations," and, while stating their own belief in general bimetallism, suggested two plans short of this, to which Mr. Alfred Rothschild, of the British delegation, added a third. The resolution was favored by most of the delegations, who indeed would not otherwise have been sent there; but was too general to be of any service, and was laid on the table and not taken up. A special committee reported on the three schemes before it: (1) That of A. Soetbeer, too involved for international agreement; (2) Rothschild's, as altered in committee, essentially, that all Europe should buy 30,000,000 ounces of silver yearly, the United States to keep on buying 54,000,000; that unlimited free coinage should be established in British India and Mexico; the agreement should run for five years unless silver rose to an agreed price before that; (3) Moritz Levy's, laid before the conference of 1881, to withdraw from circulation all gold coin and notes under 20 francs. The British delegation refused to support this unless joined with something like the Rothschild plan of maintaining the gold price of silver; the Latin Union members would not have this amendment because it involved fresh purchases of silver; nor the United States, because of its unfairness; and Rothschild withdrew his plan. Thereupon the conference began discussing bimetallism till they adjourned, 15 December, for the holidays, to reconvene the following May if the governments thought it advisable; but the election of President Cleveland meantime had taken the subjects out of the immediate political field as an adjunct, and the conference did not meet again. See INTERNATIONAL LAW; UNITED STATES, DIPLOMACY OF THE.

BRUSSELS LACE. See LACE.

BRUSSELS SPROUTS, a garden vegetable (*Brassica oleracea* var. *gemmifera*), derived from the same species as cabbage and cauliflower (qq.v.), like which it is cultivated as an autumn crop more widely in Europe than in America. It is distinguished by producing in the axils of the leaves, buds or cabbage-like heads, an inch or more in diameter. Some varieties attain a height of four feet and produce sprouts on nearly the whole length of the stem. It takes its name from Brussels, Belgium.

BRUT, Roman de, a poem in eight-syllable verse, composed by Robert Wace, but indirectly modeled upon a legendary chronicle of Brittany, entitled 'Brut y Brenhined' (Brutus of Brittany) discovered in Armorica by Walter, archdeacon of Oxford, and translated into Latin by Geoffrey of Monmouth. Wace presented his poem to Eleonore of Guyenne in 1155, and it was translated into Anglo-Saxon by Layamon.

The poem relates that after the capture of Troy by the Greeks Æneas came to Italy with his son, Ascanius, and espoused Lavinia, daughter of King Latinus, who duly presented a son to him. This son, as well as Ascanius, succeeded to the throne, which devolved at last upon Silvius, son of Ascanius, who became the father of Brutus, from whom the 'Roman' takes its name. Brutus slew his father with a misdirected arrow and fled. First he went to Greece, where he delivered the Trojan captives; next he conquered the Armorican Isles, to which he gave the name of Britain. Afterward he made war upon the King of Poitou and founded the city of Tours, which he named in honor of his son. From Poitou he returned to the Armorican Isles, overcoming the giants in possession, and renamed it Britain. He founded the city of London and reigned long and gloriously there.

The narrative now concerns itself with the descendants of Brutus. The adventures of Lear, of Belin, of Brennus who voyaged to Italy, of Cassivellaunus who so bravely resisted Cæsar, of all the bellicose chiefs who opposed the dominion of the Roman emperors, are minutely related. King Arthur, however, is the real hero of the 'Roman de Brut.' Arthur performs prodigies of valor, is the ideal knight of his order of the Round Table, and finally departs for some unknown region, where it is implied he becomes immortal, and never desists from the performance of deeds of valor. In this portion of the narrative figure the enchanter Merlin, the Holy Grail, or chalice in which were caught the last drops of the

Saviour's blood as he was taken from the cross, Lancelot of the Lake, Tristan and his unhallowed love, Perceval and his quest of the Holy Grail. The 'Roman' became unprecedentedly popular and it was publicly read at the court of the Norman kings. The British Museum holds the two manuscripts of his work.

BRÜTT, Ferdinand, German painter: b. Hamburg, 13 July 1849. He was educated at the Weimar Art School and settled in Düsseldorf in 1876; was professor at the art school there in 1893; and in 1900 went to Kronberg. Together with L. Bokelmann he developed a new type of genre painting in the stvle of the Belgians, Leys and Gallait, representing courtroom scenes. The subjects of his earlier pictures were from the life of the modern peasants or from the history of the 18th century, but afterward he painted scenes from the life of the city; he has since turned to the painting of landscapes and historical subjects, like the extensive frescoes in the Römer at Frankfort. His works include 'Peasant Delegation'; 'The Prince on the Promenade'; 'At the Exchange'; 'In the Art Gallery'; 'The Hour of Decision'; 'Christus Victor'; 'Christmas Morning.'

BRUTTII, an ancient people of Italy, living in the southwestern peninsula, now Calabria. The Greeks had several flourishing colonies on the coast and had to some extent conquered the inhabitants of the interior; the Lucanians also made themselves masters of some portions of the interior. But about 350 the people revolted, and assisted by the Lucanians, gained their independence and captured several Greek cities. At this time they were called by the Greeks Bruttii (rebels). They remained independent until they united with Pyrrhus against Rome and were subdued by the Romans in 272 B.C. In the second Punic war they sided with Hannibal, and after his expulsion from Italy were heavily punished by the Romans, robbed of considerable of their territory, entirely deprived of their independence and not allowed to bear arms. Their chief towns were Consentia and Petelia. A great forest spread through the country, from which great quantities of pitch were obtained. Augustus joined the country of the Bruttii and Lucania to form the Third Region, which, under Diocletian became a province under a governor.

BRUTUS, or **BRUTE,** in the fabulous history of Britain, the first king of the island, according to Geoffrey of Monmouth. He is said to have been the son of Silvius and grandson of Ascanius, the son of Æneas, and to have been born in Italy. He slew his father, Silvius, fled to Greece, thence to Britain, where he founded New Troy or London. He landed at Totness, in Devonshire, destroyed the giants who then inhabited Albion, and called the island from his own name. At his death the island was divided among his three sons: Locrine had England, Cumber, Wales, and Albanact, Scotland.

BRUTUS, Decimus Junius Albinus, Roman soldier: d. 43 B.C. He served under Cæsar in the Gallic war, and in the civil war he commanded the fleet destined to besiege Massilia, ancient Marseilles. Cæsar afterward appointed him to the government of further Gaul, and, in case of Octavian's death, nominated him as one of his heirs. Nevertheless he joined the conspiracy against Cæsar, and volunteered, on the memorable Ides of March, to conduct his friend and benefactor to the place of slaughter. When the tragedy was consummated, Decimus Brutus retired to Cisalpine Gaul, and there maintained himself for some time, but was ultimately deserted by his troops, betrayed to Antony and put to death by order of that general. Consult Appian, B. C. (III, 97); Dio Cassius (XLVI, 53); Cæsar, B. G. (III, 2), B. C. (I. 36, 45).

BRUTUS, Lucius Junius, a Roman patriot, sometimes called the Elder, to distinguish him from Marcus Junius, the slayer of Cæsar, lived about 500 B.C. According to the legend, he was the son of Marcus Junius and the elder daughter of Tarquin the Proud, the last king of Rome, and is represented as having saved his life from the cruelty of that prince by feigning idiocy, whence he received the surname of Brutus (Stupid). Yet the King associated him with his own sons, Aruns and Titus, in a mission which he sent to Delphi to inquire into the meaning of a portent, which had caused much alarm at Rome. After receiving the reply to the question they were charged to propound, the young men enquired of the oracle which of the three should be king of Rome, no one of them being, it is observable, heir to that dignity. To this the reply was, «Whichever shall first kiss his mother.» So, on their return to Italy, Titus and Aruns ran to kiss the Queen mother; but Lucius Junius, as he landed from the galley, pretending to slip, fell prostrate and kissed the soil of Rome, in the belief that by «mother» the oracle had meant mother earth. When Lucretia, the wife of Collatinus, plunged a dagger into her bosom that she might not outlive the insult which she had suffered from Sextus, the son of Tarquin, Brutus is said to have drawn the dagger from the wound, and to have sworn vengeance against the Tarquins whose banishment he then demanded and procured. Then (about 509 B.C.) he is said to have been chosen one of the two first consuls. According to the legend, a conspiracy to restore the monarchy having been supported by the two sons of Brutus, he, after the crime had been proved, ordered the lictors to execute the law, and did not leave the assembly till after the execution. At length Tarquin marched against Rome. The consuls advanced to meet him. Brutus led the cavalry; Aruns, son of Tarquin, commanded the body opposed to him. They pierced each other with their spears at the same moment, and both fell. The Romans conquered, and Brutus was buried with great splendor. The details of the story of Brutus, which may be regarded as a poetical legend, have been shown by Niebuhr to be irreconcilable with history. Consult Bondurant, 'Decimus Junius Brutus Albinus' (Chicago 1907).

BRUTUS, Marcus Junius, Roman republican: b. 85 B.C.; d. 42 B.C. He was the son of that Marcus Junius Brutus whom Pompey caused to be murdered, and of Servilia, the half-sister of Cato. He lost his father when he was only eight years old, but his mother and uncles carefully directed his education. On the outbreak of the civil war he followed the example of Cato, and joined the Pompeians, notwithstanding his aversion to their leader. After the unfortunate battle of Pharsalia, he surrendered himself to Cæsar, who received him generously, allowed him to withdraw from the war, made him in the following year governor of Cisalpine Gaul and afterward conferred on him the government of Macedonia. Notwithstanding these benefits, Brutus allowed himself to be drawn by Cassius and others into the conspiracy against Cæsar, who had now made himself master of the supreme power in the state. Cæsar was assassinated in the Senate house. In public speeches Brutus explained the reasons of this deed, but he could not appease the dissatisfaction of the people, and retired with his party to the capitol. Antony succeeded in exciting the popular indignation against the murderers of Cæsar, and they were compelled to flee from Rome. Brutus went to Athens, raised a large force, and also gained over the troops in Macedonia. Thus, master of all Greece and Macedonia, he stood at the head of a powerful army. He went to Asia and joined Cassius, whose forces were also strong. At Philippi they fought the army of Antony and Octavius. Cassius was beaten by Antony, and caused himself to be killed. Brutus repulsed Octavius, by whom, however, he was soon afterward totally defeated. Seeing his cause ruined, he ended his life by falling upon his sword. The glamour thrown over the character of Brutus by Shakespeare will not bear scrutiny. He was at one time a relentless usurer and did not hesitate to apply to Cicero as governor of Cilicia for power to make unlawful exactions. Brutus was a man of little independent judgment, a mere student, liable to be swayed by others, and he was in no sense a martyr to a genuine patriotism. He was the author of philosophical and historical treatises, orations, etc., none of which now survive. We still have part of his correspondence with Cicero. Cicero dedicated to him his ‘Orator,’ a description of the ideal orator, and called his history of Roman oratory ‘Brutus.’

BRUYAS, Jacques, zhäk brü-yą, French Jesuit: b. 1637; d. 1712. In 1666 on coming to Canada he went as a missionary to the Iroquois, and later established one of the earliest missions among the Mohawk Indians. He was a student of their language, and wrote in Latin a valuable work on the ‘Mohawk Radicals.’

BRUYERE, Jean de la, brü yâr. See La Bruyère.

BRUYN, Barthel, bär'tĕl broin, German painter: b. Cologne 1493; d. about 1556. His earlier works show the influence of some of the German masters, but later he imitated Michelangelo and other Italian painters. His masterpiece is the altarpiece for the church of Saint Victor at Xanten. His numerous works are mostly in Cologne and Munich; among them are ‘Martyrdom of Saint Ursula’; ‘Adoration of the Magi’; ‘Corpus Christi’; ‘Saint Catherine’; and a number of portraits, including ‘A Man and His Wife’ (1532 Strassburg); ‘Young Patrician and his Wife’ (1534 Berlin Museum); ‘An Old Man in a Black Cap and His Wife’ (Wiesbaden); ‘Burgomaster Braweiler’ (1535 Cologne). Other paintings are to be found in Vienna, Dresden, Berlin, Cologne, Antwerp. His son, Bartholomæus the Younger (died before 1610) inherited his father's studio, but was inferior to him in painting. He has been called the “Master with the Pale Faces” by reason of this characteristic in his paintings. He was a member of the Council of Cologne (1566–1606), and, when his eyesight failed, became bannerman of the city in 1591. Consult Firmenich-Richartz, E., ‘Bartholomæus Bruyn und seine Schule’ (Leipzig 1891).

BRUX, Czechoslovakia, a town of Bohemia, on the Biela, 48 miles northwest of Prague. The Schlossberg, 1,300 feet high, crowned by the ruins of an ancient castle, overlooks the town, with its interesting Gothic Dechanteikirche dating from 1517, and its new Rathaus. Brown coal is extensively mined, the neighboring saline springs of Seidlitz, Püllna and Seidschütz attract numerous visitors, and breweries, distilleries, manufactures of sugar, enameled ware, cast iron, machinery and potash, constitute the chief industries. In a battle here in 1421 the Saxons defeated the Hussites. Pop. 22,500.

BRYAN, Charles Page, American diplomat: b. Chicago, 2 Oct. 1856; d. 13 March 1918. After two years at the University of Virginia, he studied law at George Washington (then Columbian) University. He was elected member of the Colorado house of representatives in 1880 and of the Illinois lower house from 1888 to 1897. As a representative of the Chicago World Fair he visited Europe twice, and was successively United States Minister to China, Brazil, Switzerland, Portugal and Belgium from 1897 until he was appointed Ambassador extraordinary and plenipotentiary to Japan 1911–12. The Emperor of Japan conferred on him the Grand Cordon of the Rising Sun.

BRYAN, Elmer Burritt, American educator and college president: b. Van Wert, Ohio, 23 April 1865. After studies at Indiana, Harvard and Clark Universities, he held various pedagogical positions in Indiana, at Butler College and Indiana University, and became general superintendent of education in the Philippine Islands, and principal of the Insular Normal School. He returned to Indiana University in 1903; in 1905 became president of Franklin College and in 1909 of Colgate University. He is author of ‘Nascent Stages and their Pedagogical Significance’ (1900); ‘The Basis of Practical Teaching’ (1905); ‘Fundamental Facts for the Teacher’ (1912).

BRYAN, William Jennings, American political leader: b. Salem, Ill., 19 March 1860. He was graduated at Illinois College, Jacksonville, in 1881, and at the Union College of Law, Chicago, in 1883. He practised law at Jacksonville from 1883 to 1887, when he removed to Lincoln, Neb. He was elected to Congress in 1890, and again in 1892. From 1894 to 1896 he was editor of the Omaha *World-Herald*. In 1896 he was nominated for President by the Democratic National Convention at Chicago, and also by the People's party and Free-Silver Republicans, on a platform demanding the free and unlimited coinage of silver by the United States at a ratio of 16 to 1, regardless of the action of other nations, a financial policy which he had for some time advocated with much earnestness and eloquence of both tongue and pen. He was defeated at the polls by McKinley. During the war with Spain, he was colonel of a Nebraska regiment of volunteers, but saw no field service. In 1900 he was a presidential candidate, of the Democrats, Populists and Free-Silver Republicans, upon an anti-imperialistic and anti-trust platform, with a reiterated demand for free-silver. He was again defeated by William McKinley. Soon after the election he established *The Commoner,* a political weekly. Made tour of the world in 1906 and contributed to newspapers. In 1908 he was again the Democratic candidate for President, and received 162 electoral votes, against 321 for William H. Taft, March 4, 1913, he was appointed Secretary ot State by President Wilson; occupied that position until his resignation 9 June 1915. While Secretary he was instrumental in promoting closer relations with Latin America and he negotiated 30 treaties with as many governments, representing three-fourths of the population of world. These treaties embody a plan which he had been advocating for many years, whereby the parties agree: (1) That all disputes of every character and kind shall, when they defy diplomatic settlement, be submitted to an international tribunal for investigation and report; (2) the time allowed for the investigation shall not exceed one year; (3) the contracting parties agree that during the investigation there shall be no declaration of war or commencement of hostilities; (4) the contracting parties reserve the right to act independently at the conclusion of the investigation. It is expected that these investigations will reduce war to a remote possibility. After resignation he devoted himself largely to the cause of international peace. When the United States declared war, he supported its policy. He wrote 'The First Battle: a Story of the Campaign of 1896' (1897), which contains some of his speeches and a biographical sketch by his wife; 'Under Other Flags' (1904); 'The Old World and Its Ways' (1907). Also many articles in magazines and newspapers.

BRYAN, Ohio, village and county-seat of Williams County, 55 miles southwest of Toledo, on the Lake Shore and Michigan Southern and the Cincinnati Northern railroads. The village owns the electric-lighting plant and the waterworks, and includes in its industrial establishments condensed milk factories, wheelbarrow works, agricultural implements and show-case works, etc. Pop. (1920) 4,252.

BRYAN, Tex., city and county-seat of Brazos County, 100 miles southwest of Houston, on the International and Great Northern and the Houston and Texas Central railroads. It contains a Carnegie library, the Allen Academy, a convent, a Baptist academy and the Free-Will Baptist Academic and Collegiate Institute. It has a large trade in cotton and live stock and contains cotton compresses, gins, oil mills and fertilizer works. The electric plant and waterworks are the property of the city. Four miles from Bryan is situated the Texas Agricultural and Mechanical College. The city is governed under the commission-manager plan. Pop. (1920) 6,307.

BRYANT, Henry Grier, American explorer and geographer: b. Allegheny City, Pa., 7 Nov. 1859. He was graduated at Princeton 1883, and from the law department of the University of Pennsylvania, 1886. He has contributed literary articles to various magazines and encyclopædias. In 1891 he organized and conducted an exploring expedition to the Grand Falls of Labrador, was second in command of the Peary Relief Expedition in 1892, was leader of the Peary Auxiliary Expedition of 1894 and in 1897 led an exploring expedition to the Mount Saint Elias region of Alaska. In 1912 he explored and surveyed the Saint Augustine River in southeast Labrador. He has been a delegate to various international geographical congresses and since 1897 has served many terms as president ot the Geographical Society of Philadelphia. He is president of the American Alpine Club; fellow, Royal Geographical Society of London; Officier de l'Academie (France); corresponding member of the Geographical societies of Stockholm and Geneva; member American Philosophical Society, etc.

BRYANT, Jacob, English philologist and antiquarian: b. Plymouth 1715; d. 1804. He studied at Eton and King's College, Cambridge, became afterward tutor of the sons of the famous Duke of Marlborough, the eldest of whom he also accompanied to the Continent as his secretary. After his return he received, by the influence of his patron, a lucrative post in the ordnance, which gave him leisure for his researches into Biblical, Roman and Grecian antiquities. His most important work is the 'New System of Ancient Mythology' (1774–76), a fantastic and now valueless treatise. He wrote also many other works of interest to antiquarians. He left his library to King's College, and endowed the superannuated collegers of Eton. He was engaged in a famous dispute on the veracity of Homer and the existence of Troy, in which he endeavored to show that there never was such a city as Troy, and that the whole expedition of the Greeks was a mere fiction of Homer. The object of one of his earlier treatises, which appeared in 1767, is to show that the island Melita, on which Saint Paul was wrecked, was not Malta, but situated in the Adriatic. He endeavored to illustrate the Scriptures by explanations drawn from Josephus, from Philo the Jew and from Justin Martyr; but in this, as in all his writings, his learning and his ingenuity are misled by his love of controversy and paradox.

BRYANT, John Howard, American poet: b. Cummington, Mass., 22 July 1807; d. Princeton, Ill., 14 Jan. 1902. He was a brother of William Cullen Bryant (q.v.). He studied at the Rensselaer Polytechnic Institute, Troy, N. Y., removed to Illinois in 1831; from 1832 until his death lived on his farm at Princeton, performing the greater part of its work with his own hands. He held numerous local offices, served in the State legislature in 1842 and 1858; was a Free-soil candidate for Congress in 1854 and a delegate to the convention which organized the Republican party in 1856. He was an intimate friend of Abraham Lincoln, who appointed him collector of internal revenue for the Fifth Illinois district, 1862–66. The poems which were the product of his leisure hours show him as a lover of nature, which he described minutely and effectively, and a man of refined tastes and kindly feelings. His first printed poem, ‹My Native Village,› appeared in the *United States Review and Literary Gazette* in 1826, his brother William then being editor of that journal. His collected works may be found in ‹Poems› (1855), and ‹Poems Written from Youth to Old Age, 1824–84,› privately printed in Princeton, Ill., in 1885.

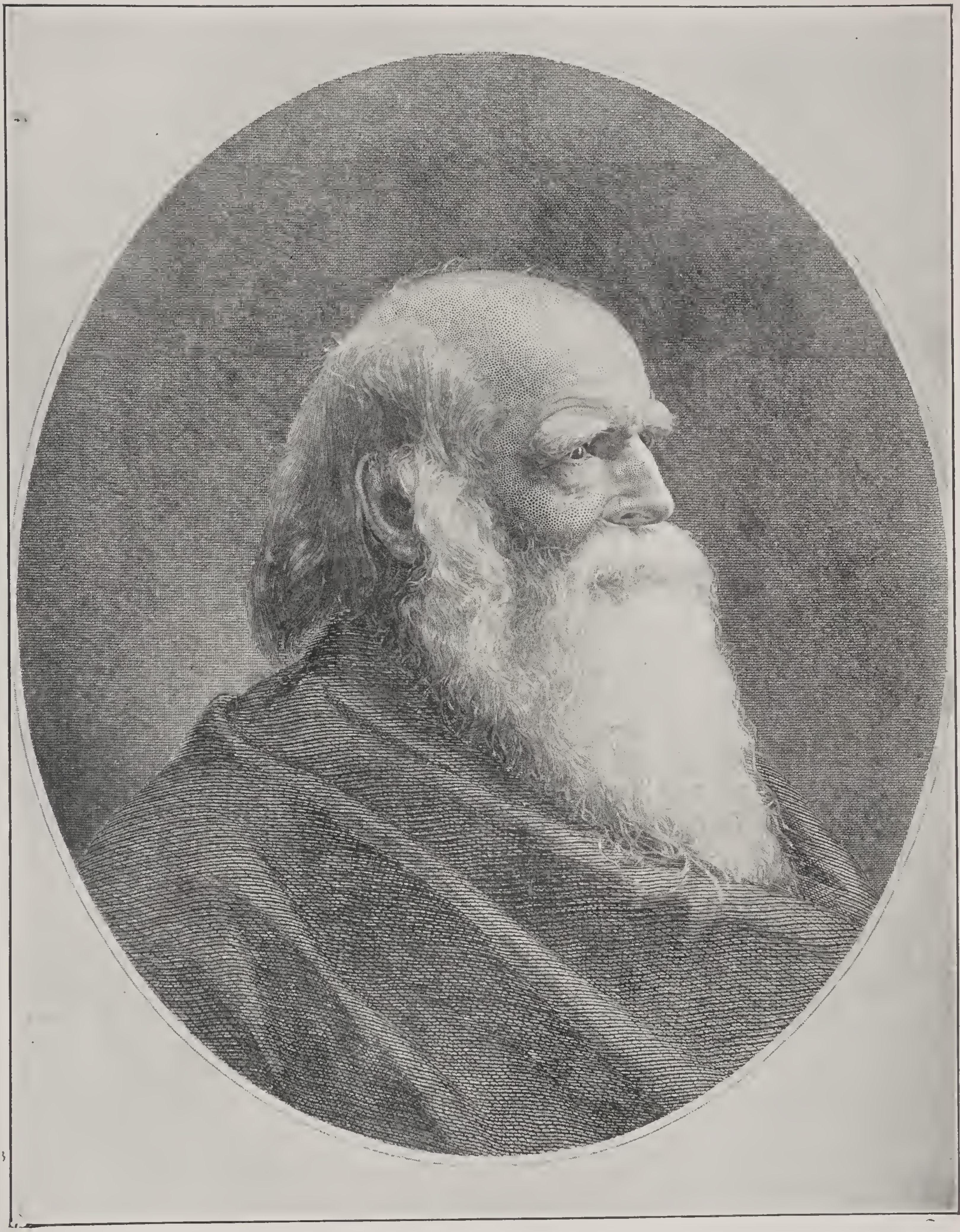
BRYANT, Joseph Decatur, American surgeon and author: b. East Troy, Wis., 12 March 1845; d. 7 April 1914. A graduate of Bellevue Hospital Medical College in 1868, he was attached to the faculty in various positions until he became professor of anatomy and clinical surgery and associate professor of orthopedic surgery in 1883, later, in 1898, becoming professor in the principles and practice of surgery and consulting surgeon to several New York hospitals. In 1882 he had been appointed surgeon-general of the State by President Cleveland, whose personal friend and physician he was. In 1908 New York University conferred upon him the degree of LL.D. Besides numerous medical monographs, he was the author of ‹Operative Surgery› (2 vols., 1905); ‹Bryant and Buck's American Practice of Surgery› (8 vols., 1906–11).

BRYANT, William Cullen, American poet and journalist: b. Cummington, Mass., 3 Nov. 1794; d. New York, 12 June 1878. His father, Dr. Peter Bryant, a physician, was a man of much literary culture, as well as large experience in public affairs. He prepared, when he was but 14, a collection of poems, which were published in Boston in 1809. In that volume appeared ‹The Embargo,› the only poem dealing with the politics of the day he ever wrote. In the following year Bryant entered Williams College as a student of law, but left without taking a degree in 1815, when he was admitted to the bar. In that year be became a contributor to the *North American Review,* in which appeared the following year his ‹Thanatopsis,› a poem in blank verse, which from the first has commanded profound admiration. Six years later he published a second collection of poems, which brought him into a wide fame. The principal piece, ‹The Ages,› is a didactic poem, in which he sketches the past progress of the world, concluding with a glowing picture of America, and its occupation by the new race. He definitely abandoned law for literature in 1825, and went to New York, where he founded the New York *Review,* and a year after became the editor of the *Evening Post,* an old established paper, with which he was connected till his death. In 1832 he issued another collection of poems, which was republished in Great Britain with a preface by Washington Irving. In the summer of 1834, accompanied by his family, he went to Europe, and traveled through England, France, Germany and Italy, remaining in the latter country for a considerable time. In 1845 he again visited Europe, and still again in 1849, when he extended his journey to Egypt and the Holy Land. The incidents of these and subsequent travels, both in Europe and America, were described in letters written to the *Evening Post,* which were reprinted in separate volumes, entitled ‹Letters of a Traveler› (1850); ‹Letters from Spain and Other Countries› (1859); ‹Letters from the East› (1869); ‹Orations and Addresses› (1873). A complete edition of his poems up to 1855 was published in that year, and in 1863 appeared a small volume entitled ‹Thirty Poems.› His last works of importance are his transations of the ‹Iliad› (1870) and the ‹Odyssey› (1872), translations which many American critics rank above any that had hitherto appeared in the English language. Early in 1878 appeared ‹The Flood of Years,› his last poem of any great length, in which the poet, in strains that remind the reader of ‹Thanatopsis,› reviews the life of man as the ridge of a wave ever hurrying on to oblivion the forms that appear on its surface but for a moment, concluding, however, with the expression of a confident hope in the future of mankind, even though the present is most dark and drear. His death was occasioned by a sunstroke, while making an address at the unveiling of a statue in Central Park. At the time of his death he was engaged in conjunction with Sydney Howard Gay, on a popular history of the United States, the first volume of which appeared in 1876. (See THANATOPSIS). Consult Bradley, W. A., ‹W. C. Bryant› (New York 1905); Godwin, Parke, ‹The Life and Works of William Cullen Bryant› (New York 1883–84); Bigelow, John, ‹Life of William Cullen Bryant› (Boston 1890); Stedman, E. C., ‹Poets of America› (Boston 1885); Stoddard, ‹Poetical Works of Bryant,› with biographical introduction (New York 1907); Wendell, Barrett, ‹A Literary History of America› (New York 1900).

BRYAXIS, Greek sculptor: flourished in the 4th century B.C. He cast a statue in bronze of Seleucus, King of Syria, and assisted in adorning the mausoleum with bas-reliefs. He also executed five gigantic statues at Rhodes, a statute of Pasiphæ and other works. According to Clemens Alexandrinus, two of his statues were attributed by some to the celebrated Phidias.

BRYCE, George, Canadian educationist: b. Mount Pleasant, near Brantford, Ontario, 22 April 1844. He was a graduate of Toronto University, and was ordained to the ministry of the Presbyterian Church in 1871. He was first pastor of Knox Church, Winnipeg, organized Manitoba College, and was head of the science department of the University of Manitoba, 1891–1904. His literary works, which deal mainly with the Canadian Northwest, include ‹Manitoba: its Infancy, Progress and Present Condition› (1882); ‹Short History of the Canadian People› (1887); ‹Remarkable History of the Hudson's Bay Company› (1900); ‹Romantic Settlement of Selkirk's Colonists› (1909).

BRYCE (VISCOUNT), **James,** British historian and diplomat: b. Belfast, 10 May 1838. His father, James Bryce, LL.D., was a Scotchman, well known as a distinguished teacher and geologist, and a master in a high school of Glasgow from 1846 to 1874. He received his early education at the high school and University of Glasgow, and afterward at Trinity College, Oxford, where he was graduated B.A. with a double first-class in 1862, being in the same year elected a fellow of Oriel College. In 1867 he became a barrister of Lincoln's Inn. From 1870 till his resignation in 1893, he was regius professor of civil law at Oxford. He



WILLIAM CULLEN BRYANT

entered Parliament in 1880 as member for the Tower Hamlets division of London, and from 1885 represented South Aberdeen as a Liberal and Home Ruler. He was chancellor of the duchy of Lancaster, a member of the cabinet in the Liberal ministry of 1892, and president of the Board of Trade (1894–95). In 1905–06 he was Chief Secretary for Ireland, and from 1907–12 Ambassador to the United States. He received the degree of D.C.L. of Oxford, LL.D. of Edinburgh and Glasgow; in 1894 was elected a fellow of the Royal Society, and many foreign honors were conferred on him. In 1907 he received the Order of Merit and 1 Jan. 1914 was created Viscount Bryce of Dechmont. His two most important works are 'The Holy Roman Empire' (1864, afterward enlarged and republished) and 'The American Commonwealth' (1888; new ed. revised and enlarged 1910), a very full exposition of the American constitution, system of government, and administration, political machinery, etc. He also wrote 'Transcaucasia and Ararat' (1877); 'Impressions of South Africa' (1897); 'Studies in History and Jurisprudence' (1901); 'Studies in Contemporary Biography' (1903); 'South America: Observations and Impressions' (1912; Sp. trans., 'La América del Sud' by Guillermo Riviera, 1913); 'University and Historical Addresses' (1913).

BRYCE, Lloyd, American editor and novelist: b. Flushing, L. I., N. Y., 20 Sept. 1851; d. New York, 2 April 1917. He was educated at Georgetown University and at Oxford. He was a member of the 50th Congress (1887–89), directing his efforts there to harbor improvements, copyright matters, etc. In 1889, his friend, Allen Thorndyke Rice, died, leaving him a controlling interest in the *North American Review.* He purchased the other interests and conducted the *Review* until 1896. He was United States Minister to the Netherlands and Luxemburg 1911–13. His works include 'Paradise'; 'A Dream of Conquest'; 'The Romance of An Alter Ego'; 'Friends in Exile'; 'The Literary Duet'; 'After Christianity, what?'

BRYCE COMMITTEE. A committee appointed on 15 Dec. 1914 by Mr. Asquith, then British Premier, "to consider and advise on the evidence collected on behalf of His Majesty's government as to outrages alleged to have been committed by German troops during the present war, cases of alleged maltreatment of civilians in the invaded territories and breaches of the laws and established usages of war; and to prepare a report for His Majesty's government showing the conclusion at which they arrive on the evidence now available." Under the chairmanship of Viscount Bryce, formerly British Ambassador to the United States, the following were appointed to serve: Rt. Hon. Sir Frederick Pollock, K.C., Rt. Hon. Sir Edward Clarke, K.C., Sir Alfred Hopkinson, K.C., Mr. H. A. L. Fisher, a noted historian and vice-chancellor of the University of Sheffield, and Mr. Harold Cox, a former M.P., a well-known journalist and editor of the *Edinburgh Review.* Two secretaries, both barristers, Messrs. E. G. Mears and W. J. H. Brodrick, were appointed, and Sir Kenelm E. Digby, K.C., became an additional member of the Committee on 22 Jan. 1915. A great number of Belgian refugees had been conveyed to England during the early stages of the war. For some months before the appointment of the Committee the Home Office had been collecting a large body of evidence taken from Belgian witnesses, some soldiers, but most of them civilians from those towns and villages through which the German army passed, and from British officers and soldiers. Over 1,200 depositions made by these witnesses were submitted to and considered by the Committee. The depositions were in all cases taken down in the United Kingdom by persons of legal knowledge and experience; they had no authority to administer an oath. The officials were instructed not to "lead" the witnesses, or make any suggestions to them; but they were to cross-examine them, so far as the testimony given provided materials for cross-examination. Care was taken to impress upon each witness that the giving of evidence was a grave and serious matter, and every deposition submitted to the Committee was signed by the witness in the presence of the examiner. The printed evidence is all couched in the very words which the witnesses used, and where they spoke in Flemish or French, pains were taken to have competent translators, and to make certain that the translation was exact. The Committee also had before them about 90 diaries taken from German soldiers who had fallen or been taken prisoners. After five months of investigation the Committee published their report in May 1915, with an appendix containing the verbatim evidence and facsimile reproductions of extracts from the diaries referred to above. The document makes gruesome reading. While making due allowance for "some exaggeration in one witness, possible delusion in another, inaccuracies in a third," the Committee arrived at a "definite conclusion" to the effect that "Murder, lust, and pillage prevailed over many parts of Belgium on a scale unparalleled in any war between civilized nations during the last three centuries." The report stated (1) "That there were in many parts of Belgium deliberate and systematically organized massacres of the civil population, accompanied by many isolated murders and other outrages. (2) "That in the conduct of the war generally innocent civilians, both men and women, were murdered in large numbers, women violated, and children murdered. (3) "That looting, house burning, and the wanton destruction of property were ordered and countenanced by the officers of the German army, that elaborate provision had been made for systematic incendiarism at the very outbreak of the war, and that the burning and destruction were frequent where no military necessity could be alleged, being indeed part of a system of general terrorization. (4) "That the rules and usages of war were frequently broken, particularly by the using of civilians, including women and children, as a shield for advancing forces exposed to fire, to a less degree by killing the wounded and prisoners, and in the frequent abuse of the Red Cross and the White Flag." In conclusion, the Committee expressed the "hope that as soon as the present war is over, the nations of the world in council will consider what means can be provided and sanctions devised to prevent the recurrence of such horrors as our generation is now witnessing."

The German point of view was quoted by the Springfield *Republican* (May 1915) from the semi-official *Kölnische Zeitung:* «We all made one fundamental principle clear: for the fault of the individual the community to which he belonged must suffer. The village in which our troops had been shot at by the civilian population was burned down. If the culprit was not discovered, a few representatives were taken out of the general population and shot. Women and children were not touched, except when they were found with weapons in their hands. This principle may seem hard and cruel — it has been developed from the customs of modern and ancient war history, and, as far as it can be spoken of at all, recognized. It is also justified by the theory of setting an awful example (‹Abschrecken›). The innocent must suffer with the guilty . . . War is no drawing-room game: war is hell-fire. He who sticks his finger into it will burn his hand, his soul, and his life. The poor, confused, misled Belgian nation has been sacrificed to this fate.»

Shortly after the destruction of Louvain, when the allegations against German troops had gained world-wide attention, the German government commenced an enquiry into the charges made by the Belgians. The results of the investigation were published at Berlin in a White Book (May 1915) headed «Offenses against International Law in the Conduct of the War by the Belgians.» The shooting of civilians, and the destruction of towns and villages, are claimed as military necessities forced upon the German army by the illegal activities of *franc-tireurs* (q.v.). The charges of looting and drunkenness were not replied to in the report; but the names of the heretofore unknown officers responsible for the alleged atrocities were revealed. Consult ‹Report of the Committee on Alleged German Outrages, Appointed by His Britannic Majesty's Government and presided over by the Rt. Hon. Viscount Bryce› (2 parts, London 1915); Mears, E. G., ‹The Destruction of Belgium: Germany's Confession and Avoidance› (pamphlet, London 1916). See also Aerschot; Alost; Andenne; Charleroi; Dinant; Gelrode; Liége; Louvain; Malines; Namur; Tamines; Termonde.

BRYCE REPORT. See Bryce Committee.

BRYDEN, Henry Anderson, English author: b. 3 May 1854. He was educated at Cheltenham College, and later studied for the bar. In early life he won a national reputation as an athlete, especially as runner. His travels in South Africa have been extensive. Among his books are ‹Kloof and Karroo›; ‹Gun and Camera in Southern Africa›; ‹Tales of South Africa›; ‹Nature and Sport in South Africa›; ‹An Exiled Scot› (1899); ‹Animals of Africa› (1900); ‹Big Game Shooting› (1905); ‹The Gold Kloof› (1907); ‹Highways and Byways of Sport and Nature› (1913); ‹Tales of Sport and Mystery› (1913).

BRYENNIOS, brē-ĕn′ nē-ōs, **Philotheos,** Greek theologian: b. Constantinople in 1833. He attended the universities of Munich, Berlin and Leipzig. His German education gave him the point of view of the western theological world and made him liberal in his religious views; and he has ever shown himself appreciative of Catholic religious thought. This he showed by attending the Bonn Old Catholics' Conference (1875). From the position of professor of Church history at Chalkis, Bryennios was raised to that of metropolitan of Seres and, later on, to that of metropolitan of Nicomedia. He first attracted the attention of the literary world by the publication of the first complete manuscript of the two ‹Epistles of Clement, in 1875. This was followed in 1883 by another manuscript of ‹The Teachings of the Twelve Apostles.› These manuscripts he had discovered in 1873, in the Holy Sepulchre, in Constantinople, both bound together under one cover, with several other manuscripts. Around them a very considerable literature, controversial and critical, has grown up.

BRYMNER, Douglas, Canadian archivist: b. Greenock, Scotland, 1823; d. 1902. Trained for a mercantile career, he was engaged in business until 1856, when ill health compelled his retirement. He emigrated to Canada in 1857, and engaged in journalism, becoming editor of the *Presbyterian* and associate editor of the Montreal *Herald.* In 1872 he was appointed Dominion archivist and for 30 years labored tirelessly in collecting and arranging the historical records and documents of Canada. His series of annual reports on the Canadian archives constitute a rich treasury of original documents of every phase of Dominion history.

BRYMNER, William, Canadian artist: b. Greenock, Scotland, 1855. He studied in Paris; received a gold medal at the Pan-American Exhibition and a silver medal at the Saint Louis Exhibition. He is president of the Royal Canadian Academy.

BRYN MAWR COLLEGE, an educational institution for women, at Bryn Mawr, Pa.; founded in 1880 by Joseph Taylor. Bryn Mawr is distinctive among women's colleges in that its course and method of study are based upon the university model. The system of «major and minor elections in fixed combination» has been adopted; students are grouped in accordance with the work they have actually accomplished instead of by arbitrary classes; original research is in all cases encouraged; and, in pursuance of the same policy, of placing the scholarship of the college upon a basis of pure merit, candidates for admission as undergraduates are not accepted upon certificate, and honorary degrees are not granted. The college offers to graduate degrees of A.B., A.M. and Ph.D. Fifteen resident fellowships, 24 graduate scholarships and 4 European fellowships are offered to graduate students, 10 graduate scholarships are offered to English, German and French women, and there are also 50 scholarships and a students' loan fund for undergraduates. Bryn Mawr has grown rapidly since its foundation, and in 1920 had 66 professors and instructors and a student body of 467. The library, largely designed for specialized study, contained in the same year over 68,000 bound volumes and 10,000 pamphlets, including the classical library of Professor Sauppe of Göttingen. The college buildings include six halls of residence, accommodating from 60 to 70 students each — Taylor Hall containing the lecture-rooms and office of administration, a large library building, with a book capacity of

187,000 volumes, 14 seminar rooms, lecture rooms, laboratories, a model school, etc., a well-equipped gymnasium, Dalton Hall, a lighting and heating plant, an infirmary, two apartment hotels for men and women professors and nine houses for professors. The endowment fund is $1,890,000, the value of the buildings and grounds $1,950,000, and the annual income about $302,700.

BRYONY (*Bryonia*), a genus of 12 climbing perennial herbs of the family *Cucurbitaceæ*, natives of Europe and Asia. Common bryony (*B. dioica*), which attains a height of from 6 to 12 feet, has long, white, branching, ill-smelling, fleshy roots, one-half inch thick; five-lobed roundish leaves; racemes of staminate flowers and axillary, greenish-white, pistillate flowers in corymbs, followed by red berries as large as peas. Probably because of its repulsive odor the plant has been reputed as poisonous, but is used to some extent medicinally. Common bryony is frequently planted for ornament in Europe, but like its relatives has not become very popular in the United States for this purpose. White bryony (*B. alba*) attains a height of from 6 to 12 feet, has thick, yellowish, tuberculate roots, long-petioled leaves and long-stemmed pistillate flowers in racemose corymbs. Black bryony (*Tamus communis*) belongs to the family *Dioscoreaceæ*.

BRYOPHYLLUM, a small genus of succulent herbs of the family *Crassulaceæ,* natives of warm climates. *B. pinnatum,* the only species commonly cultivated, is a native of the tropics. It is two to four feet high with reddish stems, fleshy leaves and compound panicles of pendulous flowers. Both calyx and corolla are reddish green and cylindrical, the former about an inch long, the latter two inches or more. The plant is specially interesting, since the leaves when laid on damp sand or moss or placed in moist air produce new plants from the notches in their margins. In Bermuda, where they are called «floppers,» in some of the West Indian islands, and parts of the southern United States, the plant is a weed in fencerows, upon stone walls, etc., and sometimes a pest in fields.

BRYOZOA, the name given by Ehrenberg to a class of molluscoid animals, the peculiarities of which have been previously observed by J. V. Thompson, who had called them polyzoa. See POLYZOA.

BRZEZANY, Poland (‹birch-town›), a town of Galicia, on the Zlota-Lipa near the Dneister, 49 miles southeast of Lemberg. It has tanneries, alcohol distilleries, and an active trade in grain and farm produce. Pop. 12,000.

BRZOZOWSKI, Theodor, Jesuit general: d. 5 Feb. 1820. He succeeded Gabriel Gruber 2 Sept. 1805 as 19th general of the Jesuit order, and was active in the restoration of the society throughout Europe. His efforts in Prussia after a slight success in 1812 were nullified by the edict of 20 Dec. 1815 which, fearful of their growing influence, expelled them.

BUA, boo'a, a small island in the Adriatic, belonging to the Dalmatian district of Spalato, Jugoslavia; is connected with the town of Trau by a bridge. During the latter period of the Roman empire many political offenders and heretics were confined here. It contains six villages, of which Santa Croce, or Bua, is the principal. The productions of the island comprise dates, wine, olives, and particularly asphaltum, of which there is a remarkable well.

BUACHE, Philippe, fē-lēp bü-āsh, French geographer: b. Paris, 7 Feb. 1700; d. 24 Jan. 1773. He spent seven years in arranging a new repository of maps and charts. In 1729 he became chief geographer to the King, and in the following year a member of the Academy of Sciences in which he had been the means of instituting a professorship of geography. His notions of geography were in some respects peculiar. He asserted that there was a vast continent about the South Pole, traversed by lofty mountains and gigantic rivers. The suggestion, that at Bering Strait a connection between Asia and America might be traced, came from him. He published ‹Considérations géographiques et physiques sur les nouvelles découvertes au nord de la Grande Mer› (1753); ‹Atlas Physique› (1754).

BUANSU, boo-an-soo', a wild dog (*Cyon primærus*), found throughout India, especially in the forests along the foothills of the Himalayan Mountains. It is smaller than a wolf, but similar in habits, and reddish in color. It hunts in companies, and a pack of these dogs is able to overcome any of the wild beasts in the jungle, except the elephant and rhinoceros, but they are very shy of mankind. It is generally known in the south as the dhole.

BUBACH. See INSECTICIDE.

BUBALIS, or **BUBALE,** a North African antelope (*Alcelaphus bubalinus*), thought to be the bubalus of the ancients. It is one of the hartbeests (q.v.), and equals a large stag in size, with an ox-like head and muzzle, and lyrate horn, heavily ringed. It is bay in color, with a black tuft on the end of the tail.

BUBASTIS, or **BUBASTUS,** a city of ancient Egypt, now in ruins; mentioned in the Old Testament as Pi-Beseth, now known as Tel-Basta; situated in the delta of the Nile, southwest of Tanis; was built in honor of the goddess Pasht, called by the Greeks Bubastis. This goddess was represented by the figure of a cat, and many mummied cats have been found in the tombs of Bubastis. On the north side of the city began the canal between the Nile and the Red Sea, constructed by Pharaoh Neco. Bubastis was taken by the Persians 352 B.C. and its walls dismantled. Among the ruins of this city have been found remains of costly and magnificent temples. Here were celebrated solemn feasts to the goddess Pasht, attended by people from all parts of Egypt, even to the number of 700,000 at one time, as is stated by Herodotus.

BUBBLE SHELL, the thin, inflated bubble-like shell of a gastropod mollusk (*Bulla*), the shell usually without a spire. On each side of the head is a large swimming flap (epipodium), and one species flits about in shallow pools on mud flats. Our eastern Atlantic coast species are *Bulla occidentalis* and *Haminea solitaria,* the latter found in Vineyard Sound. They mostly live in rather deep water, at least below low-tide mark.

BUBNA UND LITTITZ, boob'na, lĭt-tĭtz', **Ferdinand** (COUNT OF), Austrian field-marshal: b. Zamersk, Bohemia, 1768; d. Milan, 6 June 1825. He was, early in life, the chamberlain of the Emperor of Austria, afterward entered the military service, and after distinguishing himself on various occasions, at Mannheim, in the defense of Bohemia (1880), and at Austerlitz, gained at Wagram, in 1809, the rank of field-marshal-lieutenant. In the war of 1813 he commanded an Austrian division with much honor, was present at the battles of Lützen, Brautzen, Dresden and Leipzig, and in 1814 received the chief command of the Austrian army which was to pass through Geneva to the south of France. He advanced upon Lyons, but was unsuccessful, till the corps of Bianchi and Hessen-Homburg came to his assistance. Bubna remained at Lyons till the return of the allied forces, and then retired to Vienna. After the landing of Napoleon in 1815, he again led a corps against Lyons, and in Savoy opposed Marshal Suchet, till Paris was conquered, and the marshal retreated beyond Lyons. He then took possession of Lyons without opposition, established a court-martial to punish the disturbers of public order and proceeded with greater severity than on his former campaign. In September he marched back to Austria, and received for his services valuable estates in Bohemia from the Emperor. In the insurrection of Piedmont, 1821, the Count de Bubna received the chief command of the Austrian troops destined to restore the ancient government. After the accomplishment of this commission, he was appointed general commandant of Lombardy.

BUBO, a genus of birds belonging to the family *Strigidæ*, or owls. They have a small ear aperture, two large feathered tufts like horns on the sides of the head and the legs feathered to the toes. *B. maximus* is the eagle owl, or great owl. It is a native of Europe. The corresponding American species is *B. virginianus*.

BUBONIC PLAGUE. An epidemic disease which has been very prevalent and terribly destructive in almost every part of the eastern hemisphere since the 3d century B.C. and probably before that time. It was referred to as the *pestilential buboes* in the writings of Rufus of Ephesus who lived in the 1st century A.D. and was said to have been prevalent for ages in Libya, Egypt and Syria. From the discoloration of the skin by effusions of blood, which is characteristic of the severe and fatal cases, it became known as the «Black Death.» It has also been known as the Levantine, Oriental, Egyptian and Pali plague. While it has been a tremendous scourge to humanity during all the ages of the Christian era it is by no means certain that all the accounts of it are descriptive of the same disease; that would be expecting too much from ancient pathology.

History.— It first appeared in Europe at Constantinople in 543 A.D., having been brought thither from Egypt. Its ravages were terrible and as many as 10,000 were said to have died from it in Constantinople in a single day. In the 14th century it was prevalent for at least 20 years not only in Europe, but in the most of the eastern world, and during that period its victims numbered from twenty-five to forty millions. In the 15th century there were frequently recurring epidemics in nearly all parts of Europe but especially in Italy, Spain, Germany, England, France and Belgium. In the 16th century China was almost depopulated by it, and it was rampant in Germany, Holland, Italy, Spain, England and Scotland. In this century also typhus fever, which has been equally well known as ship fever, spotted fever, etc., appeared in Europe, and was terribly fatal among the poor, the dirty and the underfed, the same classes which were attacked by the plague. It is not improbable that the two diseases were confused from time to time, thus giving uncertainty to the records. In the 17th century it was widely diffused and very prevalent in England, Italy, Spain, Germany and Holland. Naples is said to have lost 300,000 by it during five months in 1656, and Genoa 60,000 in about the same period. In 1665 the great plague of London occurred, with a mortality of 68,000 out of a population of 460,000. It prevailed also in other parts of England and was constantly in evidence until the beginning of the 18th century. In the 18th century it was prevalent in Germany, Austria, Sweden, Russia and other countries in the north of Europe, and then it moved to Italy and France in the south. In the 19th century Constantinople was repeatedly scourged by it as it had been so many times before and from that unfortunate city it was carried to India, Persia and other countries. From this time the disease began to receive real scientific attention, and such attention and study have been continued to the present time. It is unlikely that it will ever again obtain an extensive foothold among the white races. The last great epidemic began at Hongkong in 1894 and has continued uninterruptedly in China, India and many other countries. In 1900 it appeared in South America and soon afterward it was noted on the Pacific coast of the United States. Up to 1908 there had been 121 cases in San Francisco, 77 of which were fatal. It was observed sporadically in England between 1906 and 1911. In the Punjab, Bombay and the United Provinces of India the mortality from this disease between 1906 and 1911 was five and a half millions, while an additional two millions perished from it in other parts of India. In 1912 there were 47 cases in Porto Rico, of which 23 were fatal.

Clinical History.— After an incubation period of three to eight days the disease is ushered in with chill, fever, pain in the limbs, head and stomach, intense thirst, congested eyes, swollen tongue and profound nervous symptoms. Vomiting is of common occurrence, and constipation alternates with diarrhœa. The characteristic features are buboes or swellings of the glands in the groins, the armpits and the neck. These swellings frequently suppurate and discharge, and this is sometimes a favorable sign. In the severe cases there are carbuncles and dark discolorations of the skin, which indicate hæmorrhage. There may also be hæmorrhages from the stomach, bowels, lungs and nose, and cases in which such hæmorrhages occur are usually fatal. The disease may be fatal within 24 hours or it may continue for a month. The fatal cases almost invariably terminate by the fifth day. It is the most destructive of any known form of epidemic disease, the mortality at different periods and different localities running from 50 to almost 100 per cent.

Geography.— It is unknown in the tropics, it has prevailed most extensively in temperate climates and it is not of infrequent occurrence in cold countries like Russia, Sweden and Norway. A moist and moderately warm climate is most favorable to its development, while intense heat or cold will usually arrest it.

Sanitary Factors.— It abounds in places where the sanitary conditions are bad, sometimes in the lowlands, sometimes in the mountains, wherever the drainage is poor, the air foul, the soil saturated with filth and the houses mean and overcrowded. Those who use proper hygienic precautions are not likely to get the disease, those who live amid good or relatively good sanitary surroundings have seldom been its victims.

Method of Conveyance.— This is a germ disease and is caused by a specific organism known as the *Bacillus pestis.* It was discovered at Hongkong during the plague epidemic of 1894, by Kitasato and Yersin, working independently of each other. It was found by them in the pus from the buboes, in the lymphatic glands, in the internal organs and in the blood. The bacillus enters the body in the majority of cases by inoculation through the skin, which usually implies that there is some abrasion or break in the skin through which the bacilli can effect an entrance. It has long been supposed that the disease was communicated by the medium of filthy soil, or filthy clothing, or rags, or discharges from the bodies of those who have had the disease. It is doubtless true that it may be conveyed by any or all of these means, if the germ is really there. But a more explicit statement would be that it is conveyed and distributed by the rat-flea *Pulex cheopis.* For some time it was supposed that the bacillus was also carried by bedbugs, but that is now questioned. The principal conclusions of the ‘Report on the Plague Investigations in India’ which was published in 1907 are the following: (1) Healthy rats contracted plague from infected rats when the only apparent means of communication between the two was the rat-flea. (2) In 21 experiments out of 38, 55 per cent of healthy rats living in flea-proof cages contracted plague, after fleas collected from rats dead or dying from septicæmic plague were placed upon them. Hence the rat-flea can transmit plague from rat to rat. (3) Continuous contact of plague infected rats with healthy ones does not result in the infection of the latter if fleas are excluded. (4) If fleas are present the disease appears and spreads in proportion to the number of fleas. (5) Guinea pigs placed in plague infected houses become infested with rat-fleas and often develop plague. (6) Fleas taken from plague infected rats may infect rats in flea-proof cages. (7) Guinea pigs in plague infected houses do not get plague when protected from fleas. If in cages surrounded by sticky paper six inches in radius, they remain immune, as the fleas cannot jump over the paper. (8) Chronic plague may prevail in rats. The rat-flea, therefore, is probably the only medium by which the plague is transmitted and the present method is to destroy all rats in cities and villages, especially in seaports, where the plague has appeared. Efforts have been directed not only at the destruction of rats ashore, but they have also been directed to preventing them from getting aboard ships.

Prevention.— Preventive measures consist in destroying rats, and ground squirrels which also carry the germ-bearing flea, in examining all passengers and baggage from suspected ports, in destroying or disinfecting with live steam all suspicious clothing, bedding and merchandise, and in applying an emulsion of kerosene oil to all furniture which is likely to harbor fleas. Human beings who are suspected to have been in contact with rat-fleas should receive intravenous injections of Haffkine's prophylactic serum, which is the most reliable of any of the several serums which have been devised. This serum gives immunity for a few months and may abort the disease in its stage of incubation. The sputum, fæces and urine of the sick must be disinfected and all abrasions of the skin must be constantly protected with collodion. The point of inoculation must be found if possible and cauterized with pure carbolic acid.

Treatment.— Imperative are good nursing, the recumbent position and attention to the bladder which may become partially paralyzed. Fluid food should be given and plenty of water. Heart stimulants are indicated — alcohol, digitalis, strophanthus, strychnia and adrenalin chloride. Good results were obtained at Hongkong from internal use of pure phenol. Morphine and hyocine may be required to relieve pain. Treatment with serums is proving very satisfactory. Yersin's serum, a blood serum taken from horses that have been inoculated with the plague bacillus, has increased recoveries 15 per cent, and is an unquestioned preventive. Venal injection has proved most effective. Consult Blue, Rupert, ‘The Post-Mortem Diagnosis of Plague’ (Washington 1912); Creel, R. H., ‘Bubonic Plague’ (ib. 1914); Guiteras, S. M., ‘Plague in Havana’ (in *Journal of the American Medical Association,* Chicago, 2 Jan. 1915); Neufeld, F., ‘Seuchenentstehung und Seuchenbekämpfung’ (Berlin 1914).

BUCARAMANGA, Colombia, capital of the department of Santander, in lat. 6° 50′ N., at an elevation above sea-level of 3,036 feet. It has wide streets, electric light, theatre, hospital and public gardens. The surrounding country is an agricultural region, producing excellent crops of coffee, cocoa, cotton and tobacco. A United States consular agent resides here. Pop. (1916) 20,000.

BUCARELI Y URZUA, boo-cä-rā'lē ē ŭrt-zoo'ä, **Antonio Maria,** Spanish soldier and administrator: b. Seville, 24 Jan. 1717; d. Mexico City, 9 April 1779. He was governor of Cuba in 1760–71, and viceroy of New Spain (Mexico) from 1771 till his death.

BUCCANEER, The, a narrative poem by Richard Henry Dana. It was first published in 1827, and the scene of a portion of the work is laid in Block Island, Rhode Island.

BUCCANEERS, a name applied to various bands of English and French freebooters in America, whose exploits form a remarkable part of the history of the 17th century. The French called them «filibustiers»; the Spaniards «demons of the sea,» and among themselves they were known as «brethren of the coast.» The origin of these associations of buccaneers seems to have been the arrogant pretensions of the Spaniards to the dominion of the whole of America. The English and French settlers combining against them for mutual defense, acquired from their precarious life in the vicinity of the Spanish settlements, adventurous and lawless habits, and became ultimately, in some of the islands of the Caribbean Sea, little better than pirates. The earliest association of this kind began about 1525, but they afterward assumed greater magnitude. After the assassination of Henry IV in France in 1610, several Frenchmen sought a residence on the island of Saint Christopher, one of the Antilles. Driven thence in 1630, some of them fled to the western coast of San Domingo, others to the small island of Tortugas, in the vicinity. Several Englishmen, led by a similar disposition, associated themselves with the latter. The fugitives at San Domingo employed themselves especially in the chase of wild cattle, of which there were large herds on the island. They sold the hides to the mariners who landed on the coast, and as they cured the flesh by smoking it before the fire, like the American savages, they were called buccaneers, from the Caribee *boucan,* a place for smoke-drying meat. These hunters lived in the rudest state of nature, enjoying in common all that they had taken in the chase or acquired by robbery. The Spaniards, who could not conquer them, determined to extirpate all the cattle on the island, and thus obliged the buccaneers either to cultivate the land as husbandmen, or to join the other freebooters on the island of Tortugas. These bold adventurers attacked, in small numbers and with small means, but with an intrepidity which bade defiance to danger, not only single merchant vessels, but several of them together, and sometimes armed ships. Their common mode of attack was by boarding. They directed their efforts especially against the Spanish ships which sailed for Europe laden with the treasures of America. By the repeated losses which they suffered, the Spanish were at last so discouraged that they seldom offered a serious resistance. It happened once that a ship of the buccaneers fell in with two Spanish galleons, each of which had 60 cannon, and 1,500 men on board. To escape was impossible, and the pirates could not think of surrender. Their captain, Laurent, made a short speech to them, sent one of his men to the powder room with orders to set fire to it upon the first sign which he should give him, and then placed his men in order of battle on each side. «We must sail between the enemy's ships,» cried he to his crew, «and fire upon them to the right and left.» This manœuvre was executed with extraordinary rapidity. The fire of the pirate killed so many people on board both ships that the Spaniards were struck with a panic, and let him escape. The Spanish commander was afterward put to death on account of the disgrace which he had brought upon his nation. Their frequent losses greatly reduced the trade of the Spaniards with America. The buccaneers now began to land on the coast, and to plunder the cities. Their manner of dividing the booty was remarkable. Every one who had a share in the expedition swore that he had reserved nothing of the plunder. A false oath was of extremely rare occurrence, and was punished by banishment to an uninhabited island. The wounded first received their share, which was greater according to the severity of their wounds. The remainder was divided into equal parts, and distributed by lot. The leader received more than the others only when he had particularly distinguished himself. Those who had perished in the expedition were not forgotten. Their part was given to their relations or friends, and in default of them, to the poor and to the Church. Religion was strangely blended with their vices, and they began their enterprises with a prayer. The wealth acquired was spent in gambling and debauchery, for it was the principle of these adventurers to enjoy the present and not care for the future. The climate and their mode of life gradually diminished their number, and the vigorous measures of the British and French governments at last put an end to their outrages, which had, perhaps, been purposely tolerated. From this band of pirates arose the French settlements on the western half of San Domingo. The more famous of the buccaneers were Sir Henry Morgan, who was allowed a more or less free hand so long as he confined his activities to Spanish ships and towns, and Captain Kidd. In the 18th century these pirates came to be known as «marooners,» from their practice of marooning or placing their victims ashore on desert islands or inaccessible coasts. The most notorious of these were Avery, Blackbeard and Roberts. Much fable surrounds the narrative of the buccaneers; but trustworthy accounts have reached us, notably that of Esquemeling, a Dutchman who served under Morgan. In the first quarter of the 18th century Capt. Charles Johnson edited numerous histories of pirates and highwaymen. Consult his ‹General History of the Pyrates of New Providence› (1724), and ‹History of Highwaymen and Pirates› (1734–42). Consult also ‹History of the Buccaneers of America› (London 1816; reprinted 1891); Archenholz, ‹The History of the Pirates, Freebooters, or Buccaneers of America› (London 1807); Burney, ‹History of the Buccaneers›; Haring, ‹The Buccaneers in the West Indies in the Seventeenth Century› (London 1910); Johnston, ‹Famous Privateersmen and Adventurers of the Sea› (Boston 1911); Pyle, editor, ‹The Buccaneers and Marooners of America› (London 1891, contains the narrative of Esquemeling); Raynal, ‹History of the Two Indies›; Stockton, ‹Buccaneers and Pirates of Our Coasts› (New York 1898); Teramond, ‹Pages d'histoire; la guerre sur mer, corsaires, pirates, boucaniers, filibustiers, negriers, etc.› (Vincennes 1912).

BUCCARI, book'ka-rē, or **BAKAR**, a port on the Gulf of Quarnerno, a small bay of the Adriatic, five miles east of Fiume. It stands on the slope of a hill with a castle at the top, and its harbor, though small, is safe. Fishing, shipbuilding and linen manufacturing are carried on here, the tunny fisheries being of the greatest importance. The wine of the district is also exported. Pop. 2,092.

BUCCINATOR, from *būcina,* Lat. «trumpet,» the trumpeter's muscle, one of the maxillary group of muscles of the cheek. They are the active agents in mastication. The buccinator circumscribes the cavity of the mouth and, aided by the tongue, keeps the food under the pressure of the teeth; it also helps to shorten the pharynx from before backward, and thus assists in deglutition.

BUCCINIDÆ, a family of gastropod mollusks belonging to the order *Prosobranchiata,* and the section *Siphonostomata.* They constitute part of Cuvier's *buccinoida.* They have the shell notched in front, or with the canal abruptly reflected so as to produce a varix on the front of the shell. The leading genera are *buccinum terebra, eburna, nassa, purpura, cassis, dolium, harpa* and *Oliva.* These shellfish are much valued as the source of the dye commonly called royal purple.

BUCCINUM, the typical genus of the family *Buccinidæ.* In English they are called whelks (q.v.).

BUCCLEUCH, bŭk-klü' (now a dukedom), the title of one of the oldest families in Scotland, whose estate is in Selkirkshire. The origin of the house of the Scotts of Buccleuch dates back to the large grants of land to Sir Walter Scott of Kirkurd and Buccleuch, a border chief, by James II; but the family traced descent from Sir Richard le Scott in the reign of Alexander III (latter half of the 13th century), and first becoming conspicuous in the person of the border chieftain Sir Walter Scott, of Branxholm and Buccleuch, who distinguished himself at the battle of Pinkie (1547) and furnished material for his later namesake's poem 'The Lay of the Last Minstrel.' The son of Sir Walter, bearing the same name, was raised to the peerage, in 1606, as Lord Scott of Buccleuch, and his successor was made an earl in 1619. In 1663 the titles and estates devolved upon Anne, daughter of the second Earl, who married the Duke of Monmouth, illegitimate son of Charles II, the pair, in 1673, being created Duke and Duchess of Buccleuch, etc. Subsequently the dukedom of Queensberry passed, by marriage, into the family. The sixth Duke of Buccleuch, William Henry Walter Montagu Douglas-Scott, succeeded to the title in 1884. Consult Fraser, Sir W., 'The Scots of Buccleuch' (1878).

BUCENTAUR, a mythological being, half man and half ox or ass. The splendid galley in which the Doge of Venice annually sailed over the Adriatic on Ascension Day also bore this name. Dropping a ring into the sea, he espoused it in the name of the republic, with the words, "Desponsamus te, mare, in signum veri perpetuique dominii." The custom originated in 1176, when the Doge, having refused to deliver up the Pope, who had taken refuge in Venice, to the Emperor, encountered and defeated the imperial fleet which was sent to reduce the Venetians.

BUCEPHALUS, the horse of Alexander the Great, which he bought for 13 talents (about $5,000). Philonicus, a Thessalian, offered to sell him to King Philip; but Philip, who considered the price too great, commanded the unmanageable steed to be led away, when the young Alexander offered to mount him. He mounted accordingly, and to the astonishment of all, the horse obeyed him, and willingly submitted to his guidance, though he had never before obeyed a rider. Alexander, from this circumstance, conceived such an affection for him that he never rode upon any other horse; and Bucephalus also, when caparisoned for battle, suffered no other rider. He died of a wound, and Alexander caused him to be buried near the Hydaspes, and built over his grave a city, which he called Bucephala.

BUCER, bū'sėr, or **BUTZER, Martin,** German Protestant theologian: b. Schelestadt, Alsace, 11 Nov. 1491; d. Cambridge, 28 Feb. 1551. He entered the Dominican order in 1506, and studied at Heidelberg, but in 1521 left the order, and became a convert to Lutheranism. He was at first preacher at the court of Frederick, the Elector of the Palatinate, afterward in Strassburg, and at the same time professor in the university there for 20 years. He took part in the conference of Marburg with the hope of reconciling Luther and Zwinglius. He also attended the conference at Augsburg, where he opposed the articles of confession, and the conference at Wittenberg. In 1548 King Edward VI of England, at the suggestion of Archbishop Cranmer, invited him to Cambridge, where he was professor of theology. He was buried in the principal church at Cambridge but in 1557 Queen Mary caused his bones to be burned. The Cardinal Contarini called him the most learned divine among the heretics. He wrote a commentary on the Psalms under the name of Aretius Filinus, and many other works. Consult Baum, 'Capito and Butzer' (1860); Tollin, 'Servet und Butzer' (1880); Mentz and Erichsen, 'Zur 400-jährigen Geburtsfeier Martin Butzer' (1891). His correspondence with Philip of Hesse was published by Lenz, 'Briefwechsel Landgrafs Philipps des Grossmütigen von Hessen' (1880).

BUCH, booн, **Leopold von,** German geologist: b. Stolpe, Prussia, 26 April 1774; d. Berlin, 4 March 1853. He studied under the celebrated Werner in the mining school of Freiberg in Saxony, where Alexander von Humboldt was his fellow-student, and early began to distinguish himself by his geological writings. His first works were 'Descriptions of the Mineralogy of Landeck,' and 'The Geognosy of Silesia.' Up to 1798 he had adopted the Neptunian theory of Werner, with some modifications; but now saw cause to abandon it, and to recognize the volcanic origin of the basalts. He saw Vesuvius for the first time in 1799; but afterward, in 1805, had an opportunity, along with Humboldt and Gay Lussac, of witnessing its actual eruption. In 1802 he examined the extinct volcanoes of Auvergne in the south of France. The results of all these geological travels were given to the world in a work entitled 'Observations During Travels in Germany and Italy' (1802–09). Indefatigable as an observer, Von Buch turned his steps from the south of France in 1806, and proceeding to Scandinavia spent two years in examining its physical constitution. This furnished the materials for his well-known work entitled 'Travels in Norway and Lapland.' In 1815 he visited the Canary Islands. These volcanic isles furnished the starting point from which Von Buch commenced a regular course of study on the production and activity of volcanoes. This is attested by his standard work on the subject entitled 'Physical Description of the Canary Isles' (1825). On his return from the Canaries he visited the basaltic group of the Hebrides and the coasts of Scotland and Ireland. His geological excursions, even in countries which he had repeatedly visited before, continued without interruption at a very advanced age, till within a few months of his death. Alexander von Humboldt, who had known him intimately for a period of more than 60 years, called him the greatest geologist of our period. He was unmarried and lived aloof from the world, entirely devoted to scientific pursuits. Besides the works already mentioned he was the author of many important tracts on paleontology, as, 'On the Ammonites' (1832); 'On the Terebratulæ' (1834); 'On the Ceratites' (1841); and 'On the Cystidæ' (1845). Another of his works not to be omitter is his 'Geological Map of Germany.'

BUCHAN, David, English voyager and explorer: b. 1780; d. about 1837. He obtained a lieutenant's commission in the navy in 1806, and in 1810 his admiral, Sir John Duckworth, dispatched him to the river Exploits, for the purpose of exploring the interior and opening a communication with the natives. He reached the mouth of the river in January 1811, and with 34 men and three guides penetrated through the greatest difficulties 130 miles into the country. Buchan afterward became high sheriff of Newfoundland. On a subsequent expedition he was lost with his ship *Upton Castle*. In 1818 Buchan was appointed to the command of an Arctic expedition. The Admiralty fitted out two expeditions that year — one to discover the Northwest passage, the other to reach the North Pole. The *Dorothea* and *Trent* were the vessels selected for the second expedition, under Captain Buchan and Lieutenant (afterward Sir John) Franklin. Latitude 80° 34′ N. was the most northerly point gained by this expedition.

BUCHAN, Elspeth (SIMPSON), Scottish religious enthusiast, founder of a sect: b. near Banff 1738; d. near Dumfries 1791. She was educated in the Scottish Episcopal Church, but on her marriage to Robert Buchan, in Glasgow, became, like him, a burgher seceder. In 1779, or thereabouts, she broached dogmas of her own, soon deserted her husband and moved to Irvine, where she made a number of converts, among them Mr. Hugh Whyte, a relief clergyman. In 1784, the people assaulted Mr. Whyte's house, which the Buchanites had made their tabernacle. They then, 46 persons in all, set up a sort of communty at a farmhouse 13 miles from Dumfries, waiting for the millennium or the day of judgment, fasting for weeks in the expectation that they would be fed like the young ravens that cry, and adjuring all fleshly vanities. A few left, accusing Mrs. Buchan of tyranny and dishonesty, but the majority of her votaries were faithful to her to the last. She called her disciples around her death-bed and communicated to them, as a secret, that she was the Virgin Mary, who had been wandering through the world since the Saviour's death, and that she was only going to sleep now, and would soon conduct them to the new Jerusalem. Her disciples, in the expectation of her reappearance, refused to bury her until ordered by a justice of the peace. The sect became extinct in 1848. See BUCHANITES.

BUCHAN, John, Scottish novelist: b. Perth, Scotland, 26 Aug. 1875. He was educated at Glasgow University and Brasenose College, Oxford, and is now a member of the publishing firm of Thomas Nelson & Sons. His published books include 'Sir Quixote' (1895); 'Musa Piscatrix' (1896); 'Scholar Gipsies' (1896); 'John Burnet of Barns' (1898); 'A History of Brasenose College' (1898); 'Grey Weather' (1899); 'A Lost Lady of Old Years' (1899); 'The Half-hearted' (1900); 'The Watcher by the Threshold' (1902); 'The African Colony' (1903); 'Some Eighteenth Century Byways' (1908); 'Sir Walter Raleigh' (1911); 'The Marquis of Montrose' (1913); and 'Nelson's History of the War,' publishing serially.

BUCHAN, William, Scottish physician: b. Ancrum, Roxburghshire, 1729; d. 1805. He commenced practice at Edinburgh, and having for a considerable time directed his attention to a digest of popular medical knowledge, published in 1769 his work entitled 'Domestic Medicine; or, the Family Physician,'— an attempt to render the medical art more generally useful by showing people what is in their own power, both with respect to the prevention and cure of diseases. It is constructed on a plan similar to that adopted by Tissot on his 'Avis au Peuple.' It appealed to the wants and wishes of so large a class of the community, that, considering it to have been the first work of the kind published in Britain, there is no wonder that it should have attained success. Before the death of the author 19 large editions had been sold. Duplanil of Paris, physician to the Count d'Artois (Charles X), published a translation in five volumes, with notes, which rendered the work so popular on the Continent that in a short time no language in Christendom wanted its translation. It would almost appear that the work met with more undivided applause on the Continent than in Britain. While many English and Scottish physicians conceived that it was as apt to generate as to cure or prevent diseases, by inspiring the minds of readers with hypochondriacal notions, those of other countries entertained no such suspicions. Among the testimonies of approbation which Dr. Buchan received from abroad was a huge gold medallion, sent by the Empress Catherine of Russia, with a complimentary letter. The work became more popular in America and the West Indies than in the older hemisphere. Buchan published two other works, 'A Treatise on Gonorrhœa'; 'An Advice to Mothers on the Subject of their own Health, and on the Means of Promoting the Health, Strength and Beauty of Their Offspring.' He was buried in Westminster Abbey.

BUCHANAN, Claudius, Scottish missionary clergyman: b. Cambuslang, Scotland, 12 March 1766; d. Broxbourne, 9 Feb. 1815. He took orders in the Church of England, and was appointed chaplain to the East India Company in 1795. From this time the remainder of his life was occupied in missionary labors in India and in forwarding the translation of the Bible into the Indian languages. In 1800 he was appointed professor of Greek, Latin and English in the College of Fort William. He returned to Europe in 1808, afterward visited the Holy Land and was engaged at his death in a translation of the New Testament into Syriac. He published ‘Christian Researches in Asia, with a Notice of the Translation of the Scriptures into the Oriental Languages’ (London 1858), and several other works.

BUCHANAN, Francis, Scottish medical officer: b. Branziet, Perthshire, Sterlingshire, 15 Feb. 1762; d. 15 June 1829. He was educated in the medical profession and took his degree at Edinburgh in 1783, and was shortly afterward appointed surgeon on board of a man-of-war, but resigned because of ill health. In 1794 he entered the service ot the East India Company as a surgeon on the Bengal establishment. He traveled extensively in the East Indies, making collections illustrative of the botany, zoology, etc., of the countries which he visited, and published ‘A Journey from Madras Through the Countries of the Mysore, Canara, and Malabar, Performed Under the Orders of the Marquis Wellesley— for the Purpose of Investigating the State of Agriculture, Arts and Commerce, etc., History, Antiquities, etc., in the Dominions of the Rajah of Mysore’ (1807). He contributed largely to the scientific journals of the day, and in 1819 published a ‘History of the Kingdom of Nepal,’ and in the same year a ‘Genealogy of the Hindu Gods,’ which he had drawn up some years before with the assistance of an intelligent Brahmin. He made a statistical survey of the presidency of Bengal, the results of which appeared after his death in Calcutta, and in ‘Eastern India’ by M. Martin (3 vols., 1838). He was also superintendent of the Botanical Gardens of Calcutta in 1814. In 1822 appeared his ‘Account of the Fishes of the Ganges,’ with plates.

BUCHANAN, Franklin, American naval officer: b. Baltimore, 17 Sept. 1800; d. Talbot County, Md., 11 May 1874. At an early age he entered the navy, becoming lieutenant in 1825 and master-commandant in 1841. The organization of the United States Naval Academy at Annapolis was committed to him in 1845 and he was made the first superintendent. During the Mexican War he took part in the siege of Vera Cruz. In Commodore Perry's expedition to Japan he had command of the flagship *Susquehanna.* In 1855 he was raised to the rank of captain, was in command of the Washington navy yard in 1859, and in 1861 resigned from the United States navy, intending to follow his State in secession, but later asked to be restored. Upon the refusal of his request, he entered the Confederate navy. In command of the *Merrimac* in Hampton Roads, he sank the *Congress* and the *Cumberland,* being severely wounded during the engagement. In 1863 he commanded the naval defenses at Mobile, Ala., there constructing the ram *Tennessee.* After promotion to the rank of admiral in the Confederate navy he was for some time senior officer in the Confederate navy and commanded at the battle of Mobile Bay, where he was defeated by Farragut, lost a leg and was made prisoner. At the close of the war he became president of the Agricultural College of Maryland.

BUCHANAN, George, the chief representative of humanism in Scotland: b. near Killearn, Stirlingshire, February 1506; d. Edinburgh, 28 Sept. 1582. He came of Celtic stock, and his family though poor was of honorable descent, tracing connection some five generations back with the great houses of Albany and Lennox. His father died while George was a child, and the family of five sons and three daughters was brought up by his mother, born Agnes Heriot of Trabroun in Haddingtonshire. His early education was gained at the common schools, tradition naming those of Killearn and Dumbarton; and at the age of 14 he was sent by his maternal uncle to the University of Paris, then in the throes of the struggle between humanism and Lutherism on the one hand, and scholasticism and Catholicism on the other. He remained here for two years, his principal academic occupation being the writing of Latin verse. At the end of these two years, the death of his uncle and his own serious illness compelled his return to Scotland. In the autumn of 1523 he took part in an abortive expedition against England, led by the Regent Albany. In the spring of 1525 he went to Saint Andrews, where he graduated in October of the same year, the fee for his bachelor's certificate being remitted on account of poverty. He returned to Paris in 1526, and, after two years as a bursar of the Scots College there, he took his master's degree. Beginning in 1529, he taught for three years as «regent» in the College of Sainte Barbe, one of the most fully equipped and most liberal in the university, receiving food and lodging from the college and fees from the students. Here he was already known as a writer of stinging epigrams. He resigned his regentship to become tutor to the young Earl of Cassillis, a post he occupied for five years, living at first in Paris, but returning to Scotland with his pupil in 1536. It was during the latter part of this engagement that he first roused the antagonism of the Franciscan order by his ‘Somnium,’ a Latin poem paraphrasing the well-known Scots satire ‘How Dunbar was desyrit to be ane Fryer.’ At the conclusion of his period with Cassillis, he was appointed tutor to one of the natural sons of James V, and through this came into close relations with the court. At the instance of the King he produced two more short satires against the Franciscans, and began his ‘Franciscanus,’ a brilliant and elaborate piece of invective, finished much later. The wrath aroused by these attacks forced Buchanan to flee from Scotland to save his life; and after a short sojourn in England, where he addressed poems to Henry VIII and Cromwell, he returned to Paris. There he found Cardinal Beatoun, who had been the chief agent in driving him out of Scotland, and for safety he was glad to accept a position in the Collège de Guyenne at Bordeaux, under André de Gouvéa, formerly his colleague at Sainte Barbe. He remained here three years, counting among his pupils the celebrated Montaigne, and among his acquaintances, J. C. Scaliger. While at Bordeaux, Buchanan translated into Latin the ‘Medea’ and the ‘Alcestis’ of Euripides, and composed his two original dramas, ‘Jephthes’ and ‘Baptistes.’ Leaving Bordeaux in 1542 or 1543, he seems to have returned to Paris, where he may have taught till about 1545 in the Collège du Cardinal Lemoine; but the record of these years is obscure, and for the next three we are altogether without evidence as to his residence or occupation. In 1547 we find him in Portugal, again under André de Gouvéa, teaching in the College of Arts of the University of Coimbra. On Gouvéa's death, the college fell into the hands of the Jesuits, who proceeded to accuse Buchanan of heresy. After a persecution of a year and a half, he was shut up for some months in a monastery to be instructed in the true faith by the monks. There he made most of his famous Latin translations of the Psalms, and during the same period produced his poems to Leonora. On his liberation in 1552, he spent a short time in England, then returned to France, where for a while he held once more the office of regent, this time in the Collège Boncourt. In 1555 his patron, Charles du Cossé, Comte de Brissac, appointed him tutor to his son Timoleon, whom he instructed from the age of 12 to that of 17, living sometimes in France, sometimes in Italy. During these years Buchanan seems to have given closer attention than formerly to the religious controversies of the day; and when he returned to Scotland about 1561, he took the side of the reformed Church of Scotland. In spite of this decision for Protestantism, we find him soon after his return acting as tutor to Queen Mary and writing court masques and complimentary poems. He received an annual pension of 250 pounds Scots (pound Scots = 1/12 of an English pound), a sum apparently inadequate to his needs. In 1564 the Queen bestowed on him a pension of 500 pounds Scots from the income of the abbey of Crossraguel, but this he seems to have had difficulty in collecting. His friendly relations with Mary continued till the murder of Darnley in 1567, which turned him into her open enemy. He wrote the virulent 'Detectio Mariæ Reginæ Scotorum,' the work which was the chief means of spreading throughout Europe a belief in the guilt of the Queen. Meantime Buchanan had become an important figure in the Scottish Church, and in 1567 he was moderator of the General Assembly which demanded Mary's abdication in favor of her son. About this time he produced his two most important vernacular writings, the 'Admonition to the Trew Lordis,' a pamphlet in support of the young King James and against the house of Hamilton; and the 'Chamæleon,' an attack on Maitland of Lethington.

In 1566 Buchanan was appointed principal of Saint Leonard's College of Saint Andrew's University, but he resigned his principalship in 1570 to take charge of the education of the young King, James VI, then four years old; and he continued to superintend his instruction for about eight years. During this period he was for a short time director of chancery and later keeper of the privy seal. In spite of these appointments, he does not seem to have held, or to have sought, a leading position in politics. The most important writings of his later years were a dialogue, 'De Jure Regni apud Scotos,' a defense of Scotland's treatment of Mary, and his 'Rerum Scoticarum Historia,' published in 1582. In September of that year he died, and was buried in Grayfriars Churchyard in Edinburgh.

The comparative obscurity into which Buchanan's name and writings have sunk to-day is in striking contrast to the splendor of his contemporary reputation. Throughout the latter part of the 16th century he was regarded by men of letters in Europe as easily the most distinguished representative of humanism in Britain, and this reputation continued for more than a century after his death. The contrast is explained by the medium in which he wrote. Like most of his learned contemporaries, he had no doubt that Latin was to be the universal language of the future, and almost all his writings are in that language. His mastery of Latin remains the admiration of scholars, but for the world in general his works are dead.

By genius and temperament he was a poet, and his Latin verses represent his best work. These belong to the conventional types of his age. Of his satires, the most notable are those already mentioned, against the Franciscans. To modern taste they pass the bounds of decency, but in brilliance and point they stand in the first rank of post-classical productions. His epigrams are entitled to the same blame and the same praise. He wrote complimentary poems to most of the persons of distinction with whom he came in contact, and an epithalamium on the marriage of Mary and the Dauphin, containing a famous passage in praise of the Scots. More genuinely poetical is his piece on 'The First of May.' His love-poetry need not be taken as having any relation whatever to his experience. Such poems as those to Leonora and Neæra are merely academic exercises in the fashion of the Renaissance on the model of Catullus and Tibullus. Of his dramatic efforts, the most artistic is 'Jephthes,' a play which still holds a place among the best of the attempts to revive the drama of antiquity. 'Baptistes,' under the guise of the story of John the Baptist, is a thinly-veiled parable expressing Buchanan's views on kingship. His most ambitious poem is the 'De Sphæra,' an elaborate exposition of the Ptolemaic system of astronomy, and his most popular production is his Latin translation of the Psalms into a variety of classical metres. The last continued to be used as a schoolbook in his native country into the 19th century.

Of his prose works, his 'De Jure Regni' sets forth explicitly and with special reference to Scotland the same doctrine of the sovereignty of the people which was shadowed in 'Baptistes.' Both this work and his history earned the distinction of being later suppressed by the government. The 'Historia' covered the history of Scotland from the earliest times till 1580 and, while far from being a critical work in the modern sense, is much more discriminating than most of the chronicles that preceded it. Its chief value is for the period of his own life, and here his authority is that of the honest partisan.

The general impression left by his work is that of an acute, vigorous and independent mind, poetical rather than practical or philosophical; of a temperament capable of strong emotion; of a character showing some of the defects common to most men of his age, but on the whole straightforward and robust. And if the use of Latin has caused his writings to cease to be read to-day, it is to be remembered that for the Europe of his own time he was the foremost man of letters in Britain, and in the opinion of such judges as the Scaligers and Montaigne, the first Latin poet in Europe.

Bibliography.— Buchanan's complete works were collected by T. Ruddiman (re-edited by

Peter Burman, 2 vols., Lugduni Batavorum 1725). The vernacular writings have been issued by the Scottish Text Society, with life and notes by P. Hume Brown (Edinburgh 1892). The 'Lives' by Irving and Chalmers are now superseded by P. Hume Brown's 'George Buchanan' (Edinburgh 1890). Shorter sketches are those of D. Macmillan (Edinburgh 1906) and of Robert Wallace, 'Famous Scots Series' (Edinburgh 1900). His portraits are discussed in Drummond's 'Portraits of Knox and Buchanan' (1875). Bibliographies are given by Ruddiman and Irving.

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BUCHANAN, George, Scottish surgeon: b. Glasgow 1827; d. 1905. Became surgeon of the Western Infirmary of Glasgow and later served as civil surgeon with the British army in the Crimean War. In 1888 he was elected president of the surgical section of the British Medical Association, and for some years was professor of clinical surgery in the Glasgow University. He was the author of 'Camp Life in the Crimea'; 'On Lithotrity, with Cases'; 'Clinical Surgery'; 'Radical Cure of Inguinal Hernia in Children'; 'Talipes Varus'; 'Faure's Storage Battery and Electricity in Surgery,' and 'Anæsthesia Jubilee, a Retrospect.' He was one of the editors of the *Glasgow Medical Journal* and also edited the 10th edition of the 'Anatomist's Vade Mecum.'

BUCHANAN, Sir George William, British diplomatist: b. Copenhagen, 25 Nov. 1854. He was educated at Wellington College, entered the diplomatic service in 1876 and rose by successive stages till he became secretary of the embassy at Berlin (1901–03); Minister plenipotentiary at Sofia (1903–08); Minister at The Hague (1908–10). He was appointed Ambassador at Saint Petersburg in 1910.

BUCHANAN, Isaac, Canadian pioneer merchant and statesman: b. Glasgow 1810; d. Hamilton, Ontario, 1883. He came to Canada in 1830 to found a branch in Montreal of a wholesale business, which he developed with remarkable success. He was elected member for York in the first union Parliament, held the office of president of the council in the Taché–Macdonald ministry in 1864 and was a Dominion arbitrator 1878–83. He was one of the promoters of the Great Western Railway (later merged in the Grand Trunk) and the chief advocate of protection in pre-Confederation days, being sometimes regarded as the father of the national policy. But coupled with protection, he strongly urged the establishment of commercial union with the United States.

BUCHANAN, James, 15th President of the United States: b. near Mercersburg, Pa., 23 April 1791; d. at Wheatland, near Lancaster, Pa., 1 June 1868. The Buchanans were a Scotch-Irish family of recent migration; James was the second of 11 children. He received a good education for that time in the schools of Mercersburg and at Dickinson College, where he was graduated at the age of 19. He then studied law in an office in Lancaster, and at the age of 21 was admitted to the bar. He practised his profession very little, for almost all of his mature life was spent in the public service of the State or of the United States. His public life began in 1814 with his election to the Pennsylvania legislature where he served two terms. In 1821 he began a 10-year period of service in Congress; in 1832–33 he was Minister to Russia; from 1834–44 he was United States senator from Pennsylvania; under President Polk he was Secretary of State, 1845–49; under President Pierce he was Minister to England, 1853–56; and from 1857 to 1861 he was President, the last Democratic President for 24 years. Before he became President his experience had been mainly in legislative service and in diplomacy. During the short periods when not in office his time was yet given largely to public matters and he continued a keen interest in current political problems.

In part his absorption in politics was probably due to the lack of close family ties; he was never married, his fiancée having died just before the time set for the wedding. There was a large family connection, but none of them except a niece, Harriet Lane, appears to have come much into his life. He was quiet, well-mannered; a conservative gentleman of the old school whose only ambition was to serve the state. He began his public career as a Federalist, and as a Federalist he was elected to the Pennsylvania legislature and to Congress. He criticised severely the Democratic-Republican conduct of the War of 1812, but urged its continuance to a victorious end, and even enrolled himself in the militia, though he was not called into service. Monroe's veto message on the internal improvement bill first called his attention to the political complications involved in the nature of the Federal Union. Buchanan then began a study of American constitutional law with the result that he gradually became a Democrat, a believer in the «strict construction» of the United States constitution and in the «reserved rights» of the States. It is difficult for one of the 20th century to understand the conscientious devotion of some early American statesmen to the letter of the law without much regard to the changing social conditions back of the law. But it was an age of lawyers; nearly all statesmen and politicians were trained in law, and naturally their views of government were legalistic and theoretical.

Buchanan's 20-year record as congressman and senator was one of useful but not of brilliant service. In the House his principal service was on the judiciary committee, of which he became chairman in 1829 and which under him was credited with having accomplished needed reforms of the Federal judiciary. In general he supported the policies of President Jackson, both financial and foreign, but an increasing tendency on his part toward «strict construction» is noticeable. He opposed a Federal bankruptcy law because of its tendency toward political consolidation and he believed it would injure the character of the farming class if the latter were able to disburden themselves of obligations under the law. He objected to protective tariffs because they were at the expense of the agricultural industry. When the controversies arose over anti-slavery petitions Buchanan voted to receive them, since to do so was plainly prescribed by the United States constitution, but on the other hand he held that Congress had the authority to keep incendiary anti-slavery literature out of the mails and should exercise this right. When President Tyler broke with the Whig party and an attack was made upon his use of the veto power, Buchanan was found defending the President's constitutional right to influence legislation by the veto. As senator he held that the State legislature had the right to instruct him to vote on all important questions. In a Senate which contained Clay, Calhoun and Webster, Buchanan was known as one of the useful, working members, but he scarcely attained the first rank.

Buchanan's first connection with foreign affairs was as Minister to Russia in 1832–33. At Jackson's request he retired from Congress to undertake negotiation of treaties with Russia. He was well received and well liked at the Russian capital, and succeeded in arranging a commercial treaty. Disliking the formal etiquette of the court, he resigned and on his way home traveled in the western countries of Europe and in England. In 1844 he was named by the Pennsylvania Democrats as their candidate for the Presidency and this, added to his other qualifications, caused President Polk to make him Secretary of State. In this position he handled the Oregon Boundary Question (q.v.) and the foreign affairs connected with the annexation of Texas and the Mexican War (q.v.). Polk and Buchanan developed a vigorous foreign policy, especially concerning Latin-America, and in so doing came into conflict with England and Spain. Buchanan opposed the activities of England in Central America and in California and favored the restoration and strengthening of the Central American Federation in order to resist the encroachments of European powers. Believing that Cuba could not be held by Spain he offered $100,000,000 for the island. As Secretary of State Buchanan acquired a reputation as an able diplomat and left office firmly convinced that the most important foreign problem for the United States was the acquisition of Cuba. President Pierce, having before his inauguration sought Buchanan's advice in regard to foreign affairs, was so impressed with his views that he asked him to accept the English mission, thus practically accepting the latter's Latin-American policy. Buchanan accepted reluctantly because he had an eye to the presidential campaign of 1856 and because the position of the United States in the Central American matters had been embarrased by the Clayton-Bulwer treaty which in the previous Whig administration had reversed the policy of Buchanan and Polk. In London he was successful in securing a somewhat favorable interpretation of the treaty and also in a contention over British enlistment of soldiers in the United States. But Buchanan attained greater notoriety at this period by his connection with the so-called Ostend Manifesto (q.v.). The Pierce administration was anxious to acquire Cuba, and a new cause of trouble with Spain had arisen — the episode of the *Black Warrior* — so Secretary Marcy suggested that Buchanan, Soule, Minister to Spain, and Mason, Minister to France, should meet for a consultation over the Cuban situation. The result was the Ostend Manifesto, which was not made public, however, until the papers were called for by Congress. In this report the three ministers suggested that the United States should offer Spain $120,000,000 for the island and seize it if Spain refused, since Cuba as then governed was a dangerous nuisance from the American viewpoint.

Buchanan returned from England in 1856 to become a candidate for the Presidency. For years he had been considered as a presidential possibility, and in 1852 he was really the strongest candidate, though Pierce, "a dark horse," received the Democratic nomination. He was stronger than ever with his party and in the country at large. He was moderate in his views on the slavery issue, and his attempts to secure Cuba had gained him some support in the South. Though he supported the legislation of 1850 and 1854 relating to the extension of slavery in the territories he had not been connected with any of the bitter controversies over those measures and their results in Kansas. Pierce now received the support of the majority of the Southern Democrats, but Buchanan was easily nominated by the pressure of the conservative Democrats, North and South, and at the last received the support of Douglas. He was undoubtedly the best candidate that the party could have selected. In the campaign that followed he emphasized the fact that the Democracy constituted a national party as against the new Republican party led by Fremont which was frankly sectional. In both sections Buchanan received the support of many Whigs whose party had been wrecked on the slavery question. He was elected President by 112 electoral votes from the South and 62 from the North, against 114 from the North for Fremont, and 8 from Maryland for Fillmore, the candidate of the American party. The result showed that the Democratic party was still a national one but that the danger of sectionalization was very great. Buchanan believed it to be his task to check this trend toward separation.

Buchanan's program as President was to settle the slavery question according to the principles of the Compromise of 1850 and the Kansas-Nebraska legislation of 1854, to supervise the conduct of foreign affairs himself, with a vigorous policy against European influence in Latin-American affairs, to acquire Cuba if possible, and to prevent any further alienation of North and South. But he was destined to fail in the most important of all.

He, as a legalist would do, expected to settle the Kansas troubles by accepting the Lecompton Constitution (q.v.) and the Dred Scott Decision (q.v.). But in this many of his party would not follow him and he finally broke with Douglas on the Kansas issue. His desire to acquire Cuba alienated many Northern Democrats and the Conservative Whigs who had supported him in 1856. Fires of the controversy over slavery fed by the stories from Kansas would not be extinguished; sectionalization proceeded rapidly; the John Brown raid in 1859 crystallized Southern and much Northern opinion; the break with Douglas split the Democratic party and in the elections of 1860 the sectional alignment was definite. Buchanan supported the Breckinridge ticket, believing that the South had been unwisely irritated by such

JAMES BUCHANAN

Fifteenth President of the United States

measures as the «personal liberty» laws and by the violent anti-slavery agitation. Though his sympathies were with the South, he denied that the latter could find a remedy in secession from the Union in case of Lincoln's election. When it was known that Lincoln had been elected Buchanan expected that an attempt at secession would be made, but hoped that conservative influences in the South aided by a considerate attitude of the North would prevent it or confine the movement to a narrow area. His conduct of affairs during the last three months of his administration has been severely criticized. Even at this day it is impossible to arrive at a satisfactory estimate of his policy. When South Carolina began the secession movement on 20 Dec. 1860, his cabinet was almost evenly divided in sympathy between the North and South. He was intensely anxious to prevent civil war. He denied the possibility of peaceable secession but held that under the constitution and laws he had no power to force a State back into the Union. It would seem he confused the coercion of a State with the forcible administration of Federal law. He would hold and defend all Federal posts but would inaugurate no policy that might precipitate war. He asked Congress for legislation to deal with the situation but secured none, though the Republicans who controlled the lower house might have given it had they so desired. Even so, he appeared to believe that delay would undermine and weaken the secession movement. Consequently, he favored the Crittenden Compromise (q.v.), the Virginia Peace Convention (q.v.), and other measures designed to avoid the issue of civil war; though he refused to give any official recognition to the Confederacy. Changes in his cabinet during the last weeks brought in new advisers — Black, Dix, Stanton and Holt — who stiffened Buchanan's policy somewhat, but he was glad to turn over the administration with its responsibilities to Lincoln before war began. It is worth noting that for several weeks Lincoln made little change in policy. Buchanan retired to Wheatland, where he announced his support of Lincoln's administration and where he spent his last years writing a defense of his own administration. During these years he was vilified as if he were a traitor, and accused of cowardice and weakness of character; but in passing judgment one must remember that Buchanan, like Andrew Johnson and other notable Democrats of the strict constructionist school, was so firmly grounded in his political principles that it was hardly possible for him to act otherwise than as he did. Consult Buchanan, James, ‹Buchanan's Administration on the Eve of the Rebellion› (New York 1866); Curtis, George Ticknor, ‹Life of President Buchanan› (2 vols., New York 1883); Moore, John Bassett, ‹The Works of James Buchanan› (12 vols., Philadelphia 1908–11); Rhodes, James Ford, ‹History of the United States, 1850–1871› (Vols. I–III, New York 1907).

Walter L. Fleming,
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BUCHANAN, Joseph Rodes, American physician: b. Frankfort, Ky., 11 Dec. 1814; d. San José, Cal., 26 Dec. 1899. He was graduated as M.D. at Louisville University in 1842, and from 1846 to 1856 was professor of physiology in the Electric Medical Institute of Cincinnati. He was dean of the faculty from 1850 to 1855, and edited the medical journal connected with the institute. He was subsequently connected with similar colleges in New York and Boston. Professor Buchanan discovered what he called the sciences of Psychometry and Sarcognomy, and claimed to have demonstrated the action of the brain on the body as its controlling physiological organ. His health failing, he removed to Kansas City, and thence, in 1893 to California. From 1849 to 1856 he published *Buchanan's Journal of Man* and published ‹Outlines of Lectures on the Neurological System of Anthropology› (Cincinnati 1854); ‹Eclectic Practice of Medicine and Surgery› (Philadelphia 1868); ‹The New Education› (New York 1882); ‹Therapeutic Sarcognomy› (Boston 1884); ‹Manual of Psychometry› (1885); ‹Cerebral Physiology› (1900); ‹Periodicity› (1897); ‹Primitive Christianity› (1898).

BUCHANAN, Robert Christie, American soldier: b. Baltimore, about 1811; d. Washington, 29 Nov. 1878. He was graduated at the United States Military Academy in 1830 and served in the Black Hawk War in the rank of second lieutenant. From 1837–38 he served in the Seminole War, and from 1845–46 in the military occupation of Texas. During the Mexican War he was promoted for gallantry. In 1856 he was placed in command of the military district of Oregon and northern California. Early in the Civil War he was promoted lieutenant-colonel. He fought in the Peninsular campaign and on the Rappahannock, winning at Gaines Mills the rank of brevet colonel, and at Malvern Hill that of brevet brigadier-general. He was in the battles of Antietam and Fredericksburg, and was promoted brevet major-general. In 1864 he was assistant provost-marshal for New York. In 1870 he retired from active service.

BUCHANAN, Robert Williams, English poet and novelist: b. Caverswall, Staffordshire, 18 Aug. 1841; d. London, 10 June 1901. He received his education in Glasgow and while young went to London to engage in literature. His attack upon Dante Gabriel Rossetti, ‹The Fleshly School of Poetry,› drew a famous letter from that poet on ‹The Stealthy School of Criticism› and a scathing pamphlet from Swinburne, ‹Under the Microscope› (1872). It should be added that in later life he regretted his course in this matter. His poems include ‹Undertones› (1863); ‹Idylls and Legends of Inverburn› (1865); ‹London Poems,› his best effort (1866); ‹North Coast Poems› (1867); ‹Book of Orm, the Celt› (1868); ‹Saint Abe and His Seven Wives› (1871); ‹Napoleon Fallen: a Lyrical Drama› (1871); ‹The Drama of Kings› (1871); ‹Ballads of Love, Life and Humor› (1882); ‹The City of Dreams› (1888); ‹White Rose and Red›; ‹The Wandering Jew› (1893). His best novels are ‹The Shadow of the Sword› (1876); ‹A Child of Nature› (1879); ‹God and the Man› (1881); ‹The Martyrdom of Madeline› (1882), and ‹Foxglove Manor› (1884).

BUCHANAN, William Insco, American diplomat: b. near Covington, Ohio, 10 Sept. 1852; d. 17 Oct. 1909. Educated in country schools, living on a farm in early life; removed to Sioux City, Iowa, 1882. In 1894 he was appointed United States Minister to the Argentine Republic, and in 1903 United States Minister to the republic of Panama.

BUCHANANIA, a genus of *Anacardiaceæ*, named after Dr. Buchanan Hamilton, a well-known Indian botanist. *B. latifolia* is a large Indian tree, the kernel of the nut of which is much used in native confectionery. It also furnishes an oil and a black varnish.

BUCHANITES, bŭk'ăn-īts, a sect of enthusiasts who sprung up at Irvine, in the west of Scotland, about 1783. Rev. Hugh White, the minister of a congregation of the Relief Church in that town, having been invited to preach in the neighborhood of Glasgow, Elizabeth Buchan, the wife of a painter, was captivated with his eloquence, and writing to him, announced that he was the first who had spoken to her heart and requested permission to pay him a visit at Irvine, that the work of her conversion might be perfected. On her arrival she was joyfully received by the members of the congregation, engaged without intermission in religious exercises, went from house to house, conducted family worship, answered questions, resolved doubts, explained the Scriptures, and testified that the end of the world was at hand and that it was the duty of every Christian to abandon the concerns of time and prepare for the reception of Christ. White was complained of to the presbytery, by which he was deposed from his ministry. Thus a distinct party was formed, the meetings of which were commonly held at night, and on these occasions the new prophetess indulged in her reveries, styling herself the Woman of the Twelfth of Revelations, and White her first-born. Such gross outrage on the common sense of the inhabitants occasioned a popular tumult, to save her from the fury of which the magistrate sent her under escort to some distance; after which, with her clerical friend and about 40 deluded followers, she wandered up and down the country, singing and avowing that they were travelers for the New Jerusalem and the expectants of the immediate coming of Christ. They had a common fund, and did not consider it necessary to work, as they believed God would not suffer them to want. See BUCHAN, ELSPETH.

BUCHAREST, boo-kạ-rĕst', or **BUKAREST** (Rumanian, *Bucuresci*, that is, «city of joy»), formerly the chief city of Wallachia, now the capital of the kingdom of Rumania, on the Dimbovitza, 37 miles from its mouth. It is the most populous city of southeastern Europe after Constantinople and Budapest, and is spoken of by the Rumanians as the Paris of the East. Besides being the seat of government, Bucharest is the residence of a Greek archbishop. The houses are mostly of one story, built of brick, pointed externally, and have metal roofs. The streets are mostly narrow and crooked, the most important being the Boulevard, running from east to west, the Calea Victoriei, the Lipscani and the Karlsstrasse. There are statues to Joan Heliade-Radulescu, the father of Rumanian literature, George Lazar and others. Twelve bridges — five of iron and seven of stone — cross the Dimbovitza, a small, muddy stream that formerly caused a good deal of damage by inundations. From 1885 till 1896 extensive fortifications were erected, there being now 18 forts in the circle of defense. The inhabitants nearly all belong to the Greek Church. The churches are very numerous, but few of them are architecturally noteworthy, the chief being the metropolitan cathedral, built in 1656, restored in 1834, and standing on a hill, and the Roman Catholic cathedral, built in 1875–84, one of the chief ornaments of the city. Bucharest has a university, and connected with it a public library and a museum of natural history and antiquities. There are four lyceums, two gymnasia, some technical and military schools, a conservatory of music, girls' schools and other educational institutions. There are a few fine public buildings, of which the most conspicuous is the royal palace, recently rebuilt; among the others being the new Palace of Justice, the National Theatre, the Athenæum, the post-office and several fine hotels. What chiefly distinguishes Bucharest is the magnificence of the public gardens. There is a mixture in the population of eastern habits, with European civilization among the upper classes. The manufactures comprise iron goods, earthenware, refined petroleum, brandy, army supplies, textiles, leather, linen, soap, paper, beer, etc., but they are of no great importance. There is an active trade, Bucharest being an entrepôt both for the kingdom of Rumania and for adjacent countries. It imports manufactured goods and exports grain, wool, honey, wax, tallow and cattle, the produce of the country. In 1698, when it became the capital of Wallachia, it was only a village. It was pillaged by the Serbians in 1716; taken by the Russians in 1769 and 1806; occupied by them again in 1828–29 and 1853–54; by the Austrians in 1774, 1789 and 1854; was partly destroyed by fire in 1847, and in 1862 became the capital of Rumania, which had just been formed from the union of Moldavia and Wallachia. In 1866 a revolt in Bucharest dethroned the first ruler of united Rumania. The partition of the captured parts of European Turkey was settled among the Christian states of the Balkans by the Treaty of Bucharest, 10 Aug. 1913. Peace congresses were held here 1772–73 and in 1812, and in 1886 peace was concluded here between Serbia and Bulgaria. Pop. 338,109. See BUCHAREST, PEACE OF; BUCHAREST, UNIVERSITY OF.

BUCHAREST, Peace of, a treaty signed 28 May 1812 between Russia and the Porte. In November 1806 the Emperor Alexander took up arms for the protection of Moldavia and Wallachia, and on account of the violation of the free navigation of the Bosporus. He occupied Moldavia, upon which the Porte declared war against Russia, 7 Jan. 1807. An armistice, however, was agreed upon at Slobosia, 24 Aug. 1807, and after the expiration of the truce in April 1808, it was tacitly continued, but in April 1809 the war was renewed. The Russians advanced to Bulgaria, and after two fierce campaigns remained masters of the Danube. The Porte now offered terms of peace. A congress was opened at Bucharest in December 1811. Napoleon did all in his power to induce the Porte to continue the war; but the interposition of Great Britain and Sweden, as well as the concessions of Russia and the distrust of the Porte toward Napoleon, brought to a conclusion the Peace of

Bucharest. The Porte gave up to Russia all Bessarabia and a third of Moldavia, with the fortresses of Choczim, Bender, Ismail and Kilia, so that the Pruth, as far as its confluence with the Danube, became the boundary between the two powers, and from thence the left bank of the Danube as far as Kilia and even to its entrance into the Black Sea. The Russians gave back the rest of their conquests. In Asia the boundaries were established as before the war. The boundary then settled between Russia and Turkey was modified in favor of the Porte at the Peace of Paris, 30 March 1856.

BUCHAREST, University of, a university in the city of Bucharest, under the control of the state government of Rumania. It was founded in 1864. In addition to the usual academic, scientific and professional departments, with courses followed by about 4,300 students, there is a school of pharmacy. There are museums and laboratories connected with the university. Tuition is absolutely free in all departments of this university. The library contains over 26,000 volumes.

BUCHELER, bük'ë-lėr, **Franz**, German philologist: b. Rheinberg, 3 June 1837; d. 1908. He studied at Bonn and became professor in Freiburg in 1858 and in Greifswald in 1866; in 1870 he was called to Bonn. His specialty has been in the field of ancient Italian dialects. He has published ‘Grundriss der lateinischen Deklination’ (1866) and other important works, and since 1878 has been an associate editor of the *Rheinisches Museum für Philologie*. He was renowned equally for his great learning, his discriminating critical talent and his skill as a teacher.

BUCHER, booн'ėr, **Anton von,** German polemical writer: b. Munich, 8 Jan. 1746; d. 1817. He was educated in the Latin schools of the Jesuits, studied at Ingoldstadt and was consecrated priest in 1768. In 1771 he was appointed rector of the German schools of Munich. In his different offices as a public teacher he did a great deal in his day to instruct and enlighten his country. He incurred the enmity of the Jesuits by his satirical attacks upon them and was finally removed from his position by Maximilian Joseph II, who, however, compensated him by bestowing upon him the benefice of Engelbrechtsmünster. His contributions to the history of the Jesuits in Bavaria (‘Beiträge zur Geschichte der Jesuiten in Baiern’) are of great historical value. His collected works appeared in 1819–20.

BUCHEZ, bü-shā, **Philippe Joseph Benjamin,** French philosopher: b. Matange-la-Petite (now in Belgium), 31 March 1796; d. Rodez, France, 12 Aug. 1865. He gave himself up to the study of the natural sciences, and in particular to medicine, receiving his doctor's degree in 1825. He was bitterly hostile to the government of the Restoration and was one of those who, in 1821, founded the French Society of Carbonari. He became chief editor of the *Journal des Progrès des Sciences et Institutions Medicales,* and in 1826 assisted in editing the *Producteur,* a weekly paper which advocated the doctrines of Saint-Simonism. In 1831 he founded a journal of moral and political science, called *L'Européen,* in which he expounded those doctrines which owe their origin chiefly to himself and have been collectively denominated «Buchezism.» The fundamental idea of his system is that of the progress and development of the human race. But progress presupposes an aim, and this aim must be pointed out beforehand, or *revealed*. Thus the idea of progress leads him to the orthodox belief in revelation. This theory is worked out in his ‘Introduction à la science de l'histoire’ (1833) and his ‘Essai d'un traite complet de philosophie au point de vue du catholicisme et du progrès’ (1839). Along with his predilections for the Catholic Church he still retained his strong democratic and republican opinions, and with M. Roux-Lavergne published ‘Histoire parliamentaire de la Révolution française, ou journal des assemblées nationales, depuis 1789 jusqu'en 1815’ (40 vols., 1833–38). After the revolution of 1848 he was elected to the constituent National Assembly, of which he was soon appointed president. Thenceforth he held aloof from public life, prosecuting his studies and writing several works, among which is the ‘Histoire de la formation de la nationalité française’ (1859).

BUCHHOLZ, (booн'hälts) **FAMILY,** a series of sketches by Julius Stinde, representing life among the middle classes of the German capital. The books are entertainingly written and are very popular in Germany, reaching their 85th edition in 1900.

BÜCHNER, booн'nĕr, **Eduard,** German chemist: b. Munich 1860. A student at the universities of Munich and Erlangen, he became lecturer in chemistry at Munich in 1891; professor at Kiel in 1893; at Tübingen in 1896; at the Agricultural College of Berlin in 1898; was awarded the Nobel prize in 1907; became professor at Breslau in 1909, and was created a privy councillor in 1910. His leading contribution to science is the discovery that the alcoholic fermentation of sugars is caused by the purely chemical action of an enzyme and not by the physiological processes operating in the organism of the living yeast. With his brother he is coauthor of ‘Die Zymasegährung.’

BÜCHNER, Friedrich Karl Christian Ludwig, German physician and materialist philosopher: b. Darmstadt, 29 March 1824; d. Darmstadt, 1 May 1899. He studied at Giessen, Strassburg, Würzburg and Vienna; became a lecturer at Tübingen University, and, in 1855, published ‘Kraft and Stoff’ (14th ed., 1876; English trans., ‘Force and Matter,’ 1870), in which he attempted scientifically to establish a materialistic view of the universe. A violent controversy was raised, and Büchner saw himself compelled to resign his university post and begin medical practice in Darmstadt. He wrote numerous contributions to periodicals on physiological and pathological subjects, as also in support of his atomistic philosophy; published in the latter department ‘Natur und Geist’ (1857); ‘Aus Natur und Wissenschaft’ (1862–84); as well as works on Darwinism, the idea of God, the intelligence of animals, etc.; and translated Lyell's ‘Antiquity of Man’ (1864). Consult Janet, ‘The Materialism of the Present Day’ (1867).

BÜCHNER, Georg, German poet, brother of F. K. C. L. Büchner (q.v.): b. Goddleau, near Darmstadt, 17 Oct. 1813; d. Zürich, Switzerland, 19 Feb. 1837. In 1834 he entered the political arena with a manifesto entitled ‹The Rural Messenger› and bearing the motto «Peace to the cabin; war to the palace.» To escape arrest he fled to Strassburg, where he studied the philosophies of Descartes and Spinoza. He wrote a drama in 1834 on ‹The Death of Danton,› the work of a genuine but undisciplined poet. His ‹Complete Works,› with biography, was published in 1879.

BUCHNER, Hans, hänts, German scientist: b. Munich 1850; d. 1902. After studying at the universities of Strassburg, Giessen and Leipzig, he became lecturer on hygiene at Munich in 1880 and professor in 1892. He has made many important researches in bacteriology. In 1877 he demonstrated the resistance offered by the physical organism to microscopic bodies present in states of ulceration, inflammation and fever; and in 1890 he showed that this resistance directly depended upon the presence in the blood serum of certain clearly-defined albuminous substances. He wrote ‹Die nägelische Theorie der Infektionskrankheiten› (1883); ‹Die neue Geschichtspunkte in der Immunitätsfrage› (1892).

BÜCHNER, Luise, German poet and novelist, sister of Georg Büchner: b. 12 June 1821; d. Darmstadt, 28 Nov. 1877. Her first publication, ‹Women and Their Calling› (1855), was followed by many others on the «woman's rights question»; it commanded much attention and reached a fifth edition (1883). She wrote a volume of tales, ‹From Life› (1861); ‹Poet-Voices of Home and Foreign Lands›; several original poems; ‹Woman's Heart›; and some ‹Christmas Stories.›

BUCHON, bü-shôn, **Jean Alexandre,** French historical writer: b. Ménetou-Salon, 21 May 1791; d. 30 April 1846. Having gone to Paris, he became collaborateur on several liberal journals and early took part in the opposition to the Restoration. He was in consequence several times prosecuted by the government and his writings, such as his ‹Vie de Tasse› (1817) were interdicted. In 1821 he gave a course of lectures in the Athenæum on the history of dramatic art in England, and in the following years he traveled over the greater part of Europe for the purpose of collecting documents to illustrate the history of France during the Middle Ages. After his return he published his ‹Collection des chroniques nationales françaises, écrites en langue vulgaire du XIII^{e} au XVI^{e} siècle› (47 vols., 1824–29), which he began with the ‹Chroniques de Froissart› (15 vols., 1824–26). He was appointed inspector of the archives and libraries of France in 1828 and, in 1829, inspector-general of the departmental and communal archives, but soon lost his office through a change of ministry. In addition to the works of this indefatigable writer already mentioned, may be named his ‹Histoire populaire des français› (1832); ‹La Grèce Continentale et la Morée› (1843); ‹Histoire des Conquêtes et de l'Etablissement des Français dans les Etats de l'ancienne Grèce sous les Ville-Hardouin› (1846); besides his editions of Brantôme, etc., and his articles in cyclopedias and magazines.

BUCHTEL, book'tĕl, **Henry Augustus,** American clergyman and educator: b. Akron, Ohio, 30 Sept. 1847. He was educated at Asbury (now De Pauw) University, from which he was graduated in 1872; entered the Methodist ministry; served for a year as a missionary in Bulgaria, and held pastorates in various parts of Indiana, New York, New Jersey and Colorado. Since 1900 he has been chancellor of the University of Denver. He took an interest in State politics as a reformer and in 1907 was elected governor of the State on the Republican ticket, serving until 1909. He then returned to his duties as chancellor.

BUCHTEL COLLEGE, a coeducational institution in Akron, Ohio, founded in 1871 under the auspices of the Universalist Church and named for John R. Buchtel, who gave it $500,000. In 1910 its productive funds were $190,000 and income $49,206, and the value of the buildings and grounds about $300,000. It had 20 professors and 297 students, and some 10,000 volumes in its library. In April 1913, the trustees offered the entire plant and endowment of the college to the city of Akron as the nucleus of a municipal university. The offer was accepted by the city, and the new University of Akron came into existence on 1 Jan. 1914. The name of Buchtel College is retained for the College of Liberal Arts.

BUCHU, bū'kū, a South African name for several species of *barosma,* especially *B. crenata. crenulata* and *serratifolia.* They belong to the order *Rutaceæ* and the section *Endiosmeæ.* They have a powerful and usually offensive odor, and have been recommended as antispasmodics and diuretics.

BUCK, Carl Darling, American philologist: b. Orland, Me., 2 Oct. 1866. He was graduated from Yale in 1886; took the degree of Ph.D. there in 1889; member of the American School of Classical Studies at Athens in 1887–89; student in German universities 1889–92. In 1892 he became assistant professor, in 1900 professor, of Sanskrit and comparative philology at the University of Chicago. He has written ‹Vocalismus der Oskischen Sprache› (1892); «Discoveries in the Attic Deme of Ikaria» (in ‹Papers of the American School of Classical Study, Athens,› Vol. V); ‹The Oscan-Umbrian Verb System› (1895); ‹Latin Grammar› (1902) (with W. G. Hale); ‹Grammar of Oscan and Umbrian› (1904); ‹Introduction to the Study of the Greek Dialects› (1910); ‹Survey of the Linguistic Conditions in Chicago›; numerous articles in philological journals. In 1912 received honorary degree of Litt.D. from the University of Athens, Greece.

BUCK, Dudley, American organist and composer: b. Hartford, Conn., 10 March 1839; d. 1909. After musical study at home and in Leipzig, whence he returned in 1862, he became organist at Park Church, Hartford, and successively at Saint James' Church, Chicago, Music Hall, Boston, and Saint Ann's Church, church of the Holy Trinity and Plymouth Church, Brooklyn, retiring in 1903. He has written several books — ‹A Dictionary of Musical Terms,› a work on ‹The Influence of the Organ in History› (1882), etc. The ‹Centennial Cantata,› for the opening of the Exposition in 1876, by appointment of the United States Centennial Commission, the ‹Forty-sixth

Psalm,' the 'Legend of Don Munio,' the 'Golden Legend' and the 'Marmion' symphonic overture are among his larger works with orchestra. He has also composed chamber music, songs and male-voice pieces. Among his later works may likewise be mentioned 'The Voyage of Columbus,' 'The Light of Asia,' 'The Christian Year' and 'Deseret,' a comic opera.

BUCK, Jirah Dewey, American physician: b. Fredonia, N. Y., 20 Nov. 1838. He was graduated in 1864 from the Cleveland Homœopathic Medical College, became professor in that institution, first in physiology (1866–71), later theory and practice and finally in psychology. He afterward founded Pulte Medical College at Cincinnati, Ohio, now the medical department of the Ohio State University. He is well known for his scientific and philosophical contributions to magazines. Among his books are 'The Nature and Aims of Theosophy' (1887); 'A Study of Man' (1888); 'Mystic Masonry' (1896); 'The Genius of Freemasonry' (1908); 'Constructive Psychology' (1909); 'The New Avatar' (1909); 'The Lost Word Found' (1909); 'Christos'; 'The Soul and Sex in Education.'

BUCK, a name sometimes distinctively appropriated to the adult male of the fallow deer, the female of which is a doe. The term is often also applied to the male of other species of deer, as of the roebuck, although never to that of the red deer, which, when mature, is a stag or a hart.

BUCKBEAN, BOGBEAN, or **MARSH-TREFOIL** (*Menyanthes trifoliata*), a beautiful plant belonging to the *Menyantheæ*, subdivision of the natural order of the *Gentianaceæ*. It is common in spongy, boggy soils, throughout the northern temperate lands, and flowers about the latter end of May and early June. It has a procumbent stem rising to a height of 6 to 12 inches, and covered by the sheaths of the leaves, and a creeping jointed root. The leaves are trifoliate (like those of clover), with obtuse, ovate leaflets. The flower-stalk terminates in a thyrse of white flowers, rose-colored outwardly. The calyx is five-parted, the corolla funnel-shaped, spreading, and clothed on the inner surface with a coating of dense fleshy hairs. The fruit consists of a one-celled, two-valved capsule containing numerous seeds. The whole plant, the root especially, has an intensely bitter taste, and an extract of it ranks as a valuable tonic quite equal in its effects to gentian. It is not so frequently employed now, however, as it used to be. It is said to be beneficial in intermittent fevers, gout, liver complaints, dropsy, scurvy, etc. In the north of Europe it is sometimes used instead of hops to give bitterness to beer; and in Lapland an unpalatable kind of bread is made from the powdered roots.

BUCKBOARD, a four-wheeled vehicle having the seat mounted on an elastic board instead of springs. Buckboards were intended originally for rough and hilly roads and were rather primitive in construction, but became so popular that the styles at present employed are greatly improved in form and finish.

BUCKETS, in water-wheels, are a series of cavities into which the water is delivered, on the circumference of the wheel to be set in motion. By the revolution of the wheel the buckets will be alternately erected so as to receive water and inverted so as to discharge it; the loaded side will descend, and present the empty buckets in succession to the current, and thus keep up a constant revolution of the wheel. Buckets made of wood and of various metals, are also used for many other mechanical purposes, as in grain-elevators, dredges, etc.

BUCKEYE. The name in the central and southern United States for native species of trees of the horse-chestnut genus, especially the sweet buckeye (*Æsculus octandra*), abundant in Ohio and southward. See HORSE-CHESTNUT.

BUCKEYE STATE, a nickname applied to the State of Ohio.

BUCKHANNON, W. Va., town and county-seat of Upshur County, 40 miles south of Clarksburg, on the Baltimore and Ohio River and on the Buckhannon River. Its industrial establishments include flouring, lumber and woolen mills, glassworks, veneering factories, a tannery and a brickyard. The West Virginia Wesleyan College is located here. Pop. (1920) 3,785.

BUCKHOUND. See DEERHOUND.

BUCKINGHAM, George Villiers, 1st DUKE OF, British courtier: b. Brooksby, Leicestershire, 28 Aug. 1592; d. Portsmouth, 23 Aug. 1628. He was the unworthy favorite of James I and Charles I. His father was George Villiers, knight; his mother was descended from the ancient family of Beaumont. His father died when he was 13, and at 18 he was sent to France, where he resided three years, and acquired great skill in all bodily exercises. This, together with his beauty of person and graceful manners, made so great an impression on James I, who gave him the familiar name of Steenie, that in less than two years he was made a knight, a gentleman of the bed-chamber, viscount, Marquis of Buckingham and lord high admiral, etc., and at last dispenser of all the honors, offices, favors and revenues of the three kingdoms, according to the dictates of his ambition, his cupidity or his caprice. The nation was indignant at seeing merit undervalued, the people trampled upon, the nobility humbled, the crown impoverished and degraded, to elevate and enrich a weak and insolent favorite. Such rapid and undeserved promotion likewise caused many private jealousies. In 1623 he engaged in a romantic adventure with Charles, Prince of Wales, in connection with which traitorous views have been attributed to him. The Earl of Bristol was negotiating a marriage for the Prince with the Infanta of Spain. Buckingham persuaded the Prince to go to Madrid and carry on his suit in person. They set out incognito, passed through various adventures and saw on their way the Princess Henrietta Maria of France, whom Charles afterward married. The result of this journey is well known. The marriage was broken off, war declared with Spain and Bristol was impeached. Buckingham was created a duke during his absence, and whatever misconduct may have been associated with the design or execution of his mission, his favor with the King and Prince remained unimpaired. James died in March 1625, and in May of the same year Buckingham was sent to France as proxy for

Charles I, to marry the Princess Henrietta Maria. In the following year the unpopularity of the war with Spain, and the failure of the expedition to Cadiz, caused his impeachment, from the consequences of which he was saved by his favor with the King. His intrigues soon after brought on war with France, and he was entrusted with an expedition to succor the Rochellese, but they refused his aid, and he carried his forces to the Isle of Rhé, where, after three months spent in unskilful operations, he suffered a defeat in re-embarking which cost 2,000 men. Notwithstanding this proof of incapacity, a large force was again entrusted to him to renew the attempt on Rochelle. He went to Portsmouth to superintend the preparation, and was there assassinated by John Felton, a lieutenant who had withdrawn from the army in consequence of being disappointed in promotion.

BUCKINGHAM, George Villiers, DUKE OF, son of the preceding: b. Westminster, 30 Jan. 1628; d. Kirkby Moorside, Yorkshire, 16 April 1687. After studying at Trinity College, Cambridge, he traveled abroad, and on his return home, after the commencement of the civil war, he was presented to the King, at Oxford. He served in the royal army, under Prince Rupert and Lord Gerard. His estate was seized by the Parliament; but having obtained the restoration of it, he traveled with his brother into France and Italy. In 1648 he returned to England, and was with Charles II in Scotland, and at the battle of Worcester. He followed that Prince abroad, and served as a volunteer in the French army in Flanders. He afterward returned to England, and in 1657 married the daughter of Lord Fairfax, by which means he repaired the ruin of his fortune in the royal cause. He, however, preserved the favor of Charles II, and at the Restoration was made master of the horse. He also became one of the King's confidential ministers, who were designated by the appellation of the «Cabal» (1667–73). His political conduct was, like his general behavior, characterized by unprincipled levity and imprudence. In 1666 he engaged in a conspiracy to effect a change of the government; notwithstanding which, he recovered the favor of King Charles, which he repeatedly abused. The profligacy of his private life was notorious. He seduced the Countess of Shrewsbury, and killed her husband in a duel; and he was more than suspected of having been the instigator of the infamous Colonel Blood to his brutal outrage against the Duke of Ormond, whom he attempted, with the assistance of other ruffians, to carry to Tyburn and hang on the common gallows. In 1677 he was, together with the Earls of Shaftesbury and Salisbury and Lord Wharton, committed to the Tower for a contempt, by order of the House of Lords, but on petitioning the King, they were released. He plotted against the government with the Dissenters, and made himself an object of contempt to all parties. Pope (‹Moral Essays,› epistle 3d) has more strikingly than accurately described his death. His abilities were far superior to those of his father; and among his literary compositions the comedy, or rather the witty burlesque, of ‹The Rehearsal› may be mentioned as a work which displays no common powers, and which greatly contributed to the correction of a corrupted public taste.

BUCKINGHAM, James Silk, English traveler and editor: b. Flushing, Cornwall, 25 Aug. 1786; d. London, 30 June 1855. In 1815 he went to Bombay, and in the following year, after many vicissitudes, to Calcutta, where he established the Calcutta *Journal*, but the censorship of the press was then in full force in India, and Buckingham, having offended government, his printing presses were seized, and he himself compelled to quit the presidency of Bengal and return to England, where he began to deliver lectures in London in favor of free trade to the East and the extinction of the East India Company's monopoly. He also established in London, 1824, the *Oriental Herald*, and four years later the *Athenæum*, now one of the foremost English weeklies, and prepared for the press the manuscript journals of his travels. In 1822 appeared ‹Travels in Palestine›; in 1825, ‹Travels in Arabia›; in 1827, ‹Travels in Mesopotamia›; and in 1830, ‹Travels in Assyria and Media.› From 1832–37 he was member of Parliament for Sheffield. Subsequently he made a tour of three years in America, resulting in the publication of eight volumes on the United States and one on British North America. He was a zealous promoter of the temperance cause, and president of the London Temperance League. The last of his voluminous writings was his ‹Autobiography,› two volumes of which appeared in 1855, but its completion was prevented by the author's death.

BUCKINGHAM, Joseph Tinker, American journalist: b. Windham, Conn., 21 Dec. 1779; d. Cambridge, Mass., 11 April 1861. His father exhausted his whole property in supporting the American army during the Revolution, and died leaving a family without means of support. At Worthington, Mass., Joseph was apprenticed to a farmer, with whom he remained for several years, during which he made himself acquainted with the rudiments of an English education. At 16 he entered a printing-office and became acquainted with the elements of the profession in which he was afterward to gain distinction. In Boston, 1806, he began life for himself by the publication of *The Polyanthus*, a monthly magazine, which, after one year, was discontinued and not resumed until 1812. In 1809 he published for six months the *Ordeal*, a weekly. In 1817 he began the publication of *The New England Galaxy and Masonic Magazine*, which he continued until 1828. From 1831 to 1834 he published *The New England Magazine*. In 1824 he published the first number of the Boston *Courier*, which he continued to edit until 1848. Mr. Buckingham was several times elected to the legislature, serving in both houses. Among his publications deserving mention are ‹Specimens of Newspaper Literature, with Personal Memoirs, Anecdotes and Reminiscences› (1850); and ‹Personal Memoirs and Recollections of Editorial Life› (1852).

BUCKINGHAM, William Alfred, American politician: b. Lebanon, Conn., 28 May 1804; d. Norwich, 3 Feb. 1875. He was educated in the common schools; worked on his father's farm; was also a school-teacher, and at Norwich, 1825, began business in dry-goods, becoming later a manufacturer and something of a capitalist. In 1849 he was elected mayor of Norwich, to which office he was repeatedly chosen. For nine years (1858–66) he was governor of Connecticut, and as one of the most efficient of the "war governors" achieved a national fame. He served as United States senator from 1869 till his death. He was active in the temperance cause, and a liberal giver to Yale College and to many benevolent objects.

BUCKINGHAM, or **BUCKS,** England, south-midland county, bounded north and northwest by Northampton; northeast and east by Bedford and Hertford; southeast by Middlesex; southwest by Berks and west by Oxford. Its length, north to south, is about 45 miles; greatest breadth, east to west, 23 miles; area, 746 square miles. The vale of Aylesbury, stretching through the centre of the county, and celebrated for its fertility, furnishes rich pasturage for vast numbers of cattle and sheep. The total area under all kinds of crops, bare fallow and grass is somewhat more than 400,000 acres, of which considerably more than half is in permanent pasture. The chief cereal crops are wheat, barley and oats. The county forms a great dairying centre. The breeding and fattening of cattle are largely carried on, Herefords and short-horns being favorite breeds. The heavy arable lands in the northern part of the county are being brought under cultivation by steam plough, and are producing rich crops of beans, wheat, etc. The manufactures of Buckinghamshire are unimportant. Among them are straw-plaiting and the making of thread lace, wooden articles, such as beechen chairs, turnery, etc. There are also paper-mills, silk-mills and other manufactories. The mineral productions of this county are of no great importance. There is chalk burning and limestone quarrying. The county is watered by the Ouse, the Thame, the Thames, and other streams, and is intersected by the Great Western and Northwestern railroads. Buckingham is nominally the county town, but Aylesbury is the assize town. Buckinghamshire used to contain three parliamentary boroughs, namely, Aylesbury, Buckingham and High or Chipping Wycombe, which now give name to corresponding parliamentary divisions. The county thus returns three members to the House of Commons. It gives the title of earl to the family of Hobart Hampden. Pop. 219,551.

BUCKINGHAM, England, municipal and formerly a parliamentary borough, capital of the county of its own name, 61 miles northwest of London, situated on a peninsula formed by the Ouse, which is here crossed by three stone bridges. The town hall is a large and commodious building. The parish church, erected in 1781, is a spacious structure, with a square tower, surmounted by an elegant spire, and there are also several other places of worship, and a free grammar school, founded by Edward VI. Malting and tanning are carried on to some extent; and a good deal of business is done in wool and hops. In the vicinity are several limestone quarries, and one of marble. Pop. 3,280.

BUCKINGHAM PALACE, a royal palace in London, facing Saint James's Park. It is the town residence of the King.

BUCKLAND, Cyrus, American inventor: b. Manchester, Conn., 10 Aug. 1799; d. 26 Feb. 1891. After learning the trade of a machinist, he assisted in building the machinery for the first cotton-mills erected at Chicopee Falls, and became, in 1828, patternmaker in the United States armory, Springfield, where he remained for 28 years, becoming master mechanic. He designed machinery and tools for the manufacture of firearms; remodeled old weapons and designed new ones; perfected a lathe for turning out gun-stocks; invented machines to bore and turn gun-barrels and for rifling muskets, and many other novelties in the manufacture of firearms and ordnance. Much of his machinery was adopted by foreign governments. As he received nothing for his labor at the armory, excepting his salary, Congress voted him $10,000 when ill-health compelled him to resign. In all he received from Congress for his inventions $70,000.

BUCKLAND, Francis Trevelyan, English naturalist: b. Oxford, 17 Dec. 1826; d. London, 19 Dec. 1880. He was the son of William Buckland (q.v.); graduated at Christ Church, Oxford, and having studied medicine in Paris and London, he was for some time house surgeon to Saint George's Hospital, when he joined the 2d Life Guards as assistant surgeon, a post which he held for nine years. His strong passion for natural history soon absorbed all his thoughts, and he became a constant contributor to *Field* and other periodicals. Latterly he devoted himself with enthusiasm to pisciculture, a subject on which he was long the leading authority. His advice on the subject was sought by several foreign governments, and he was the means of introducing salmon and trout into the Australian and New Zealand waters. He was appointed inspector of salmon fisheries in 1867, and his reports as commissioner led to the passing of several useful acts of Parliament. Besides a great quantity of pleasant gossipy articles contributed to various periodicals, he published 'Curiosities of Natural History' (1857–72); the 'Logbook of a Fisherman and Zoologist' (1876); a 'Natural History of British Fishes' (1881); and other works.

BUCKLAND, William, English geologist: b. Axminster, Devon, 12 March 1784; d. 15 Aug. 1856. He was educated first at Winchester, afterward at Corpus Christi College, Oxford, took his degree of B.A. in 1803 and obtained a fellowship in 1808. From early childhood he had been familiar with the ammonites and other fossils in the lias quarries near his native town, and with advancing years the bent of his mind to geological pursuits was developed and confirmed. In 1813 he was appointed reader in mineralogy at Oxford, and in 1818 a readership of geology was instituted for him. In 1825 he was presented by his college to the living of Stoke Charity, near Whitechurch, Hants, and the same year he became one of the canons in the Christchurch Cathedral, Oxford. He was one of the eight selected to write the celebrated 'Bridgewater Treatises,' and in 1836 his essay was published, under the title of 'Geology and Mineralogy Considered with Reference to Natural Theology.' In 1845, he was made dean of Westminster, and in 1847 one of the trustees of the British Museum. His papers, contributed to various societies and periodicals, were very numerous. He was a fellow and twice president of the Geological Society of London, and of the Royal Society from 1818.

BUCKLANDIA, a handsome evergreen Javanese and East Indian tree (*B. populnea*), of the family *Hamamelidaceæ,* the only species of its genus. It is said to attain considerable height, often more than 30 feet, without branches, and occasionally a circumference of more than 20 feet at the height of a man's chest from the ground. Its timber is widely used in the Orient.

BUCKLANDITE, the name of two minerals: (1) Bucklandite of Hermann, a variety of epidote; (2) Bucklandite of Levy, a variety of allanite distinguished by being anhydrous. It occurs in small black crystals having the form and physical properties of allanite in an iron mine near Arendale, Norway.

BUCKLE, George Earle, English journalist: b. Tiverton-on-Avon, near Bath, 10 June 1854. He was educated at Winchester and at New College, Oxford, and was a fellow of All Souls College 1877–85. He was editor of the London *Times* from 1884 to 1912. On the death of W. F. Monypenny, the author of the authoritative 'Life of Benjamin Disraeli,' he undertook to complete the work, and has since published (1914–16) the third and fourth volumes of the work.

BUCKLE, Henry Thomas, English historian: b. Lee, Kent, 24 Nov. 1821; d. Damascus, 29 May 1862. He was the son of a wealthy merchant and received his education partly at home and partly at Dr. Halloway's school, Gordon House, Kentish Town. His delicate health prevented his remaining long at school, but his love of learning and indefatigable industry as a student supplied any deficiencies in his training, and he was to a great extent self-educated. He read in 19 languages and could converse fluently in seven. He was brought up on orthodox lines but early developed free-thought and radical principles. At an early age he entered his father's counting-house, but he displayed no aptitude for business; and when, at the age of 18, his father's death left him an ample fortune, he devoted himself entirely to study. The only thing he allowed to distract him from his more serious pursuits was his favorite game of chess, in which he attained such excellence as to be recognized as one of the first English masters of the game; but even this he gave up when he found it encroached too much on his time. He had formed a plan, to which he dedicated his life, of writing the 'History of Civilization in England' in conformity with certain philosophical principles and with an exhaustive treatment in regard to details which he deemed indispensable to historical accuracy, which made the work he had undertaken one of almost incalculable magnitude. For 14 years he toiled incessantly at his manuscript, but he only succeeded in finishing two volumes. The first, published in 1858, stated with copious illustrations the plan of the work; the second, issued in 1861, contained a digression on the histories of Scotland and Spain, intended further to illustrate his design and demonstrate the principles on which it was based. These works gave rise to much controversy, but it has been generally agreed that they exhibit great boldness and originality of design, with profound if not accurate scholarship, and also with a good deal of what was the object of the historian's strongest aversion in others, dogmatism. Certain it is that his work does not now stand in the high repute it did in the years immediately succeeding publication. His death occurred when he was on a journey undertaken for the restoration of his health. (See HISTORY OF CIVILIZATION IN ENGLAND). Consult Huth, A. H., 'Life' (1880); his 'Miscellaneous and Posthumous Works' (edited by Miss Taylor, 1872), and Robertson, I. M., 'Buckle and His Critics' (1895).

BUCKLE, a metal instrument consisting of a rim and tongue, forming a clasp, used for fastening straps or bands in dress, harness, etc. In making buckles both brass and iron are used, and the chief kinds are called tongue, roller, brace and gear buckles. The use of buckles, instead of shoe-strings, was introduced into England during the reign of Charles II. They soon became very fashionable, attained an enormous size (the largest being called Artois buckles, after the Comte d'Artois, brother of the King of France), and were usually made of silver, set with diamonds and other precious stones. In the latter half of the 18th century the manufacture of buckles was carried on most extensively in Birmingham, there being at one time not less than 4,000 people directly employed in that city and its vicinity, who turned out 2,500,000 pairs of buckles annually. When the trade was at its height, however, fashion changed, and in 1701 buckle-makers petitioned the Prince of Wales for sympathy, on the ground that, owing to the introduction of shoe-strings, their trade was almost ruined. The Prince promised to assist them as far as he could by wearing buckles himself and enjoining his household to do the same, but fashion was too strong even for him and, before the close of the century, a great staple trade of Birmingham had become extinct, though shoe-buckles are still by no means unknown.

BUCKLER, Fr. Bouclier, so named from the boss, *boucle,* on it, a kind of small shield formerly worn on the left arm, a piece of armor varying in form and material, among the latter being wickerwork, wood covered with leather, a combination of wood and metal, etc.

BUCKLEY, James Monroe, American clergyman and editor: b. Rahway, N. J., 16 Dec. 1836; d. Morristown, N. J., 8 Feb. 1920; educated at Pennington Seminary and Wesleyan University, studied theology at Exeter, N. H., and in 1858 entered the ministry of the Methodist Episcopal Church. He had charges at several places, including Detroit, New York and Brooklyn, the last of which he retained from 1866 to 1880. He was editor of the New York *Christian Advocate* from 1880 to 1912. He published 'Two Weeks in the Yosemite and Vicinity' (1873); 'Christians and the Theatre' (1876); 'Oats or Wild Oats' (1885); 'Travels in Three Continents' (1895); 'Extemporaneous Oratory' (1899); 'The Fundamentals and their Contrasts' (1906); 'Theory and Practice of Foreign Missions' (1911); 'Constitutional and Parliamentary History of the Methodist Episcopal Church' (1912). Consult 'Life' by George P. Mains (New York 1917).

BUCKLEY, Samuel Botsford, American botanist and geologist: b. Torrey, Yates County, N. Y., 9 May 1809; d. Austin, Tex., 18 Feb. 1884. He was graduated from Wesleyan University in 1836. During his travels in the Southern States he investigated the botany, choncology, etc., of those regions, discovering many new species of plants and shells. Among the flora was the new genus *Buckleya distichophilla,* which was named in his honor. He determined the height of Mount Buckley, North Carolina, and of several other summits. From 1860–61 he was connected with the State survey of Texas and from 1866–67, was State geologist of Texas. He was scientific editor of the *State Gazette* (Austin 1871–72). He wrote many papers of a scientific nature and a work on the trees and shrubs of the United States. A list of scientific papers written by him is contained in the *Alumni Record* of Wesleyan University.

BUCKMINSTER, Joseph Stevens, American clergyman: b. Portsmouth, N. H., 26 May 1784; d. 9 June 1812. His father, Joseph Buckminster, a scholarly and eloquent preacher, sent the son to Harvard, where he was graduated in 1800, afterward becoming a teacher in Phillips Exeter Academy, Daniel Webster being among his pupils. In 1804 he entered upon the work of the ministry as pastor of the Brattle Street Church, Boston; in 1808 he supervised the publication of Griesbach's 'New Testament' in Greek and in 1811 became lecturer of Biblical criticism at Harvard, and at once took his place as a writer and preacher of the finest gifts, to grow in power and public esteem until the day of his premature death. He was a member of the Anthology Club of Boston, and a contributor to the *Monthly Anthology.* His pulpit influence aided to develop a more literary style of sermon, while his oratorical ability was equal to his skill in composition. He was a representative of the Liberal Congregationalism, which, soon after his death, became Unitarian in belief. His works, in two volumes, were published in 1839. Consult Lee, 'Memoirs of the Buckminsters' (Boston 1851).

BUCKNELL UNIVERSITY, a coeducational institution in Lewisburg, Pa. (renamed in 1886, from the University of Lewisburg in honor of William Bucknell, its liberal benefactor) organized in 1846, under the auspices of the Baptist Church: Professors and instructors, 48; students, 703; volumes in the library, over 19,000; grounds and buildings valued at more than $523,000; endowment, $1,250,000.

BUCKNER, Simon Bolivar, American soldier and politician: b. Kentucky, 1 April 1823; d. 8 Jan. 1914. He was graduated at West Point in 1844, taught there, as assistant professor, during the next two years, and served in the Mexican War, 1846–48, under Generals Taylor and Scott. He was brevetted 1st lieutenant, and also captain, for gallantry at the battles of Churubusco and Molino del Rey. From 1848 to 1850 he served at West Point as assistant instructor in infantry tactics. In 1855 he resigned from the army and engaged in various occupations, civil and military, in Illinois and Kentucky. When the Civil War began he joined the Confederate army as a brigadier-general. Afterward he rose to distinction, attaining the rank of lieutenant-general, and taking a prominent part in several important events of the war, notably in the defense and surrender of Fort Donelson, 16 Feb. 1862. Here he was third in rank, but Generals Floyd and Pillow withdrew during the night of 15 February, and it remained to Buckner to surrender the garrison and fort to General Grant. He was exchanged the following August and led a division under Bragg in Tennessee, and was present at Murfreesboro and Chickamauga. He attained the rank of lieutenant-general and surrendered with Kirby Smith's army at Baton Rouge, La., 26 May 1865. He was one of the pall-bearers at General Grant's funeral in 1885, by the personal selection of the great soldier himself, who had been warmly attached to him for many years. In 1896 he was nominated for Vice-President by the National (Gold) Democrats on the ticket with J. M. Palmer, having previously (1887–91) served a term as governor of Kentucky.

BUCKNILL, Sir John Charles, English alienist and writer: b. Market Bosworth, Leicestershire, 1817; d. 20 July 1897. He was educated at Rugby and University College, London, graduating in medicine in 1840. He held the position of Lord Chancellor's visitor of lunatics from 1862–76, and held a high position among physicians who devoted themselves to the treatment of insanity. He was originator and sometime editor of the *Journal of Mental Science.* An ardent sportsman, keenly interested in the volunteer movement, which he did much to promote, and a student of Shakespeare. He was the author of 'Manual of Psychological Medicine' (1858); 'The Mad Folk of Shakespeare' (1859); 'The Medical Knowledge of Shakespeare' (1860). He was knighted in 1894.

BUCKRAM, a coarse fabric, linen or cotton, sized with glue. It is used in making garments to give them, by stiffening, the form intended, and as a cover in bookbinding.

BUCKSHOT, a leaden shot larger than swanshot. About 160 or 170 of them weigh a pound. They are especially designed to be used in hunting deer and other large game.

BUCKSHOT WAR, 1838, a disputed-election case in Pennsylvania, of national importance as bearing on the nature of the «domestic violence,» from which the constitution requires the Federal government to protect the States. As usual, fraud under legal forms was met by retaliation in defiance of them. The legislature that year had to elect a United States senator; and the return of Democratic candidates in Philadelphia gave that party a majority on joint ballot, though the Senate was 22 Whig (Anti-Masonic) to 11 Democratic. But the Democratic congressional candidate in one of the city districts was defeated; his party charged it to frauds in the Northern Liberties district (now in Philadelphia), and the 10 Democratic election judges threw out its entire vote of some 5,000, giving him the certificate of election. At once the seven Whig judges met and gave the certificate not only to their candidate, but to their legislative candidates who were not elected even with the Northern Liberties vote: obviously to fight till their congressman was restored. The secretary of State was chairman of the Whig State committee, received the Whig certificate first (professedly at least), refused to acknowledge any others and publicly advised his party to claim the election and hold out. Armed crowds of both parties collected at Harrisburg «to see fair play» when the legislature met, 4 December; and for some days the sessions were held with a roaring mob outside. The Whig returns alone were handed in by the secretary of State; the Whig senate organized, and then adjourned on account of the mob; one member is alleged to have threatened them with «ball and buckshot,» whence the name. In the Representatives' hall both parties organized and chose speakers, the Whigs, T. S. Cunningham, and the Democrats, William Hopkins; the former then adjourned, whereupon the latter held the hall with a guard and the Whigs had to meet outside. The Whig governor, Joseph Ritner, called on the Senate militia to be ready to rescue the capital from a «lawless mob,» and appealed to the commandant, at Carlisle, and next to President Van Buren, for help against «domestic violence,» which was refused on the ground that this phrase referred only to insurrection against lawful authorities, whereas this was only a political struggle to determine who the lawful authorities were, in which the government could not decently interfere. (The same excuse was afterward made for leaving Kansas at the mercy of the Border Ruffians, though the Federal court put the United States soldiery into their hands). About 1,000 militia were brought to Harrisburg; but after a fortnight's stay departed, as the city was entirely quiet, and the rival houses holding regular sessions. The cooler Whigs, however, saw that the secretary of State could not justify his assumption of power; enough Cunningham members joined the Hopkins house to give it a majority, and on the 25th the Senate acknowledged it as the true one, whereupon the other broke up and its members gradually drifted in — all but Thaddeus Stevens (q.v.), who would not take his seat during the session. The legislature elected as senator Daniel Sturgeon, then State treasurer, who as such refused to honor Ritner's bill for the employment of the militia.

BUCKSKIN, a soft leather of a yellowish or grayish color, made originally from deerskin, but now usually from sheepskin. The softness which is its chief characteristic is imparted by using oil or brains in dressing it. The name is also given to a kind of twilled woolen cloth without a pile or «face.»

BUCKTAILS, the New York State Democrats opposed to De Witt Clinton, 1812–28; originally the members of the Tammany Society in New York, from the buck's tail worn in their hats as a badge. Their factional opposition to Clinton, under Martin Van Buren and other important local leaders, extended to his advocacy of the Erie Canal, authorized 15 April 1817; the Tammany men were fiercest in opposition to it, and the name «Bucktails» was given to all the anti-Canal Democrats. Clinton was an ungracious and tactless politician, and in 1824 the Bucktails carried the State and ousted him from the office of canal commissioner; which primitive bit of «spoils,» in a community not then hardened to it, created a reaction that gave him two terms more in the governorship. His death in 1828 dissolved his party, and the «Bucktails,» under Van Buren and other members of the «Albany Regency» (q.v.), became the Democratic party in the State.

BUCKTHORN (*Rhamnus cathartica*), a shrub, native of Great Britain, naturalized in the United States, where it is sometimes cultivated for hedgerows. The stem is covered with a dark-brown bark, and divided into numerous branches with strong spines. It grows to a height of seven or eight feet. The leaves are elliptical and serrate. The male and female flowers are on different plants; the calyx is of a greenish yellow and the petals are minute and greenish. The fruit is a round black berry, containing four seeds. It flowers in May, and the seeds ripen in September. The berries are medicinal. They form a powerful purgative, but, being harsh in action, are seldom used in modern practice. The juice of the ripe berries, mixed with alum, forms the sap-green of artists. The bark yields a beautiful yellow dye. Several related species of *Rhamnus* are common in North America, and are also known as buckthorn.

BUCKWHEAT (*Fagopyrum*), a grain, native of Asia, and called *blé Sarrasin*, or Saracen wheat, by the French, after the Saracens or Moors, who are believed to have introduced it into Spain. It thrives on poor soils, comes rapidly to maturity and is most frequently planted in tracts that are not rich enough to support other crops. It is extremely sensitive to cold, being destroyed by the least frost, but it may be planted so late and reaped so early as to incur no danger from that source. Its flowering season continues for a long time, so that it is impossible for all the seeds to be in perfection when it is reaped, and the farmer must decide by careful observation at what period there is the greatest quantity of ripe seeds. Buckwheat does not exhaust the soil, and by its rapid growth and its shade it stifles weeds, prevents their going to seed and leaves the field clean for the next year. As a grain, buckwheat has been principally cultivated for oxen, swine and poultry; and although some farmers state that a single bushel of it is equal in quality to two bushels of oats, others assert that it is a very unprofitable food. Mixed with bran, chaff, or grain, it is sometimes given to horses. The flour of buckwheat is occasionally used for bread, but more frequently for cakes fried in a pan. In Germany it serves as an ingredient in pottage, puddings and other food. In the United States it is very extensively used for griddle-cakes. Beer may be brewed from it, and by distillation it yields an excellent spirit. It is used in Danzig in the preparation of cordial waters. Buckwheat is much cultivated by the preservers of game as a food for pheasants. If left standing it affords both food and shelter to the birds during winter. With some farmers it is the practice to sow buckwheat for the purpose only of plowing it into the ground as a manure for the land. The best time for plowing it in is when it is in full blossom, allowing the land to rest till it decomposes. While green it serves as food for sheep and oxen, and mixed with other provender it may also be given with advantage to horses.

If sown in April two green crops may be procured during the season. The blossoms may be used in dyeing a brown color. It is frequently cultivated in this country as food for bees, to whose honey it imparts a flavor by no means unpleasant. The principal advantage of buckwheat is that it is capable of being cultivated upon land which will produce scarcely anything else, and that its culture, compared with that of other grain, is attended with little expense.

BUCKWHEAT-TREE, an evergreen shrub of the genus *Cliftonia,* family *Cyrillaceæ;* also called titi. It is a native of the southern United States, where it is found in the neighborhood of water. It bears fragrant white flowers, followed by dropping fruits, which suggest the name.

BUCOLIC, a term derived from a Greek word meaning «herdsman.» It is equivalent to the word pastoral, derived from the Latin, and is applied to pastoral poetry of the kind especially descriptive of rural life as led by cowherds and mountain shepherds. Of this class of poetry Theocritus and Virgil left the highest examples. See PASTORAL POETRY.

BUCRANE, an ornamental design carved in relief on the altars of Greece and Rome. It represented an ox skull with garlands depending. This decoration is sometimes seen as an architectural detail with other animals' heads introduced in place of the original ox-head.

BUCYRUS, Ohio, city and county-seat of Crawford County, situated on the Sandusky River and on the Pennsylvania, the Ohio Central and Sandusky division of the Pennsylvania railroads. Stockraising and farming are carried on in the region and the city is actively engaged in the manufacture of machinery, ventilating apparatus, plows, vehicles and furniture. The city has fine school and county buildings, municipal waterworks, a park, and there are numerous mineral springs in the surrounding region. Bucyrus was settled in 1818 and incorporated in 1829. Pop. (1920) 10,425.

BUD, a modified shoot in which, owing to the non-development of the axis, the lateral organs become crowded together. It contains the rudiments of future organs, as stems, branches, leaves and organs of fructification. The usual form of a bud is an elongated ovoid, and according to their position they are described as terminal, that is, formed at the end of a branch, or axillary, that is, produced in the axil of a leaf. Besides the rudimentary organs found in the interior, buds are in cold or temperate climates often covered externally with a viscous and resinous coating, and furnished internally with a downy tissue, destined to defend the enclosed organs from the rigor of winter. No envelopes of this kind are observed on the buds of the greater number of tropical plants. Buds on exogenous plants are in their commencement cellular prolongations from the medullary rays, which force their way through the bark. The cellular portion is surrounded by spiral vessels, and covered with rudimentary leaves. When the vascular part of the bud develops the central cellular portion remains as pith, enclosed in a medullary sheath, which isolates it from the parent stem. Thus it remains till the second year. The bud here described, which contains the rudiments of future leaves, branches, etc., is called a leaf-bud. Sometimes more than one bud is found in or near the axil of a single leaf, in which case all but the proper axillary bud are called accessory buds. The buds begin to show themselves as soon as the leaves have taken their full development. They are then very small, as the developed leaves absorb the nutritive juices of the plant, leaving them little nourishment. On the fall of the leaf they enlarge, and take the form they are to retain during winter, in which season they are stationary. On the return of spring they begin to swell, and burst the scales which form their external covering, and the young shoots which these have served to protect now make their appearance. The external scales of the bud are usually deciduous, that is, they fall off when the young shoot appears; sometimes, however, they are persistent. These scales sometimes represent leaf-blades, as in lilac; sometimes stipules, as in the beech; or petioles, as in the horse-chestnut. Flower-buds are produced in the axil of leaves called floral leaves or bracts. They are not capable of extension by the development of the central cellular portion, and instead of the conservative organs of plants, leaves and branches, they produce the reproductive organs, flowers and fruit. Perennial herbaceous plants spring from a subterranean bud called the turio, which is developed annually, and from which the new stem is produced. The bulb is a sort of bud of this kind. The arrangement of the leaf in a leaf-bud is called its vernation; of the petals and sepals in a flower-bud, their æstivation.

BUD MOTH. An apple pest. See APPLE; INSECTS.

BUDÆUS. See BUDÉ, GUILLAUME.

BUDAPEST, boo'dạ-pĕst, Hungary, the united towns of Buda or Ofen, and Pest or Pesth, the one on the right, the other on the left of the Danube, forming the capital of Hungary, the seat of the Hungarian Parliament and Supreme Courts, about 135 miles southeast from Vienna. Buda, which is the smaller of the two, and lies on the west bank of the river (here flowing south) consists of the fortified Upper Town on a hill, the Lower Town or Water Town at the foot of the hill, and several other quarters, including Old Buda farther up the river. Among the chief buildings are the royal castle and several palaces, the arsenal, town hall, government offices, the church of Saint Mathew, dating from the 13th century, during the Turkish occupation a mosque for 150 years, and recently rebuilt; and the finest Jewish synagogue in the empire. Pest, or the portion of Budapest on the left or east bank of the river, consists of the inner town of Old Pest on the Danube, and a semi-circle of districts — Leopoldstadt, Theresienstadt, Elizabethstadt, etc.— which have grown up around it. The river is at this point somewhat wider than the Thames at London, and the broad quays of Pest extend along it from two to three miles. It is spanned by fine suspension and other bridges, the latest, the Schurplatz suspension bridge, completed in 1903 having a span of 320 yards and a width of 59 feet. Pest retains, on the whole, fewer signs of antiquity than many less venerable towns. Its fine frontage on the Danube is modern, and includes the new Houses of Parliament, opened in 1896, the Academy of Science, with a library of 180,000 volumes, exchange, custom house and other important buildings. The oldest church dates from 1500; the largest building is a huge pile used as barracks and arsenal. Other buildings include the old and the new town house, National Museum, national theatre, university buildings, various palaces, the Royal opera house, etc.

Budapest contains the most important of the three universities of Hungary, attended by about 4,500 students, and having over 220 professors, lecturers, etc. Another important educational institution is the technical high schools, with 60 teachers and 1,100 to 1,200 students, and a library of 60,000 volumes. In commerce and industry Budapest ranks next to Vienna in the empire. Its chief manufactures are machinery, gold, silver, copper and iron wares, chemicals, textile goods, leather, tobacco, etc. A large trade is done in grain, wine, wool, cattle, etc. At Budapest are the largest electrical works in all Europe. Engineers employed there have brought to perfection the science of applying electricity to motors. They constructed there the first successful underground trolley lines. The city contains the important parks of the Stadtwäldchen, about 1,000 acres in extent, and Margaret Island. It is divided into 10 municipal districts, three on the Buda side of the river, and seven on the Pest side. Budapest is strongly Magyar in character and sentiment, and as a factor in the national life may almost be regarded as equivalent to the rest of Hungary. Old Buda was founded by the Romans about 150 A.D., and was known as Aquinicum. Pest is of much later origin, first being heard of in the 13th century. The citadel of Buda was captured by the Turks after Mohacs in 1526. From 1541 to 1686 Buda was the seat of a Turkish pasha, the Turks being then driven out. The towns were united as one municipality in 1873. It was not until 1799 that the population of Pest began to outdistance that of Buda but from that date its growth was very rapid and out of all proportion to the increase of Buda. In 1799 the joint population of the two towns was little more than 50,000; in 1890 it was 506,384; in 1900, 732,322; in 1910, 880,371.

BUDAPEST, The Royal Hungarian University of, the lineal descendant of the institution established at Ofen in 1390 which had a somewhat checkered career. It reached a recognized status in 1850. It includes the four traditional faculties of theology, law, medicine and philosophy. It has a library, established in 1635, containing over 275,000 volumes and over 2,000 manuscripts. It is supported partly by the government, which furnishes half of the budget.

BUDDE, boo'dĕ, **Karl Ferdinand Reinhard,** German theologian: b. Bensberg, 1850. He was professor successively at Bonn, Strassburg and Marburg. On account of his original work in connection with the Hebrew languages and dialects and in Old Testament criticism he was given the degree of D.D. from Saint Andrew's University in 1911. Among Budde's works are ‹Die Bücher Richter und Samuel, ihr Aufbaw und ihre Quellen, (1890); ‹The Religion of Israel to the Exile› (in ‹American Lectures on the History of Religions,› 1899); ‹Die Bücher Samuel› (1902); ‹Die alte Testamente unde die Ausgrabungen› (1903); ‹Das Prophetische Schriftum› (1905); ‹Geschichte der althebräischen Litteratur› (1906); ‹Auf dem Wege zu Monotheismus› (1910).

BUDDHA («The Enlightened One»), the founder of the Buddhist religion: b. near Kapilavastu, India, 570–560 B.C.; d. near Kusinārā, India, 490–480 B.C. (the exact dates are uncertain). The name Buddha is a theological title (see BUDDHISM), and its bearer was usually known to his contemporaries by his family name Gotama (or, in Sanskrit, Gautama). The facts of his life are enveloped in a mist of pious legend, but it appears certain that he was the son of Suddhodana, a chieftain of the Sākya clan (whence Gotama's epithet Sākyamuni, «Sage of the Sākyas»), who inhabited a district at the base of the Himalayas on the border of the present Nepal, almost due north of Benares. Gotama is said to have received the personal name Siddhattha (Sanskrit Siddhārtha), «he who has accomplished his purpose,» and to have been brought up by his aunt Mahā-Pajāpati (Sanskrit Prajāpati), his mother Māyā having died seven days after his birth. He passed his early years in ease and luxury, but he seems to have been deeply impressed by the misery of the world, as exemplified by old age, sickness and death. At the age of 29, his spiritual unrest caused him to leave his home, his wife and his new-born son, and to go forth as a wandering ascetic. He attached himself in turn to two religious teachers, Alāra and Uddaka, but, finding their systems inadequate, he resolved to practise the severest forms of bodily penance. According to the Buddhist texts, he continued to do this for six years until he was nigh death. Then, suddenly abandoning his self-torture, he gave himself to profound meditation, and during one night's ecstatic vigil he attained the supreme knowledge and enlightenment that constituted him the Buddha. The tradition names as the scene of this crisis the sacred Bodhi tree («tree of enlightenment») at Uruvelā (now Bodh-Gayā in Bengal, about 60 miles south of Patna).

After spending some weeks in meditation, Gotama, now «the Buddha,» resolved, according to the texts, to proclaim his doctrine to the world, and sought out five ascetics who had formerly been his companions and who were then living in the «Deer-park» near Benares. By his first sermon he converted them, an event which is celebrated as «The Setting in Motion of the Wheel of the Law.» He soon gathered 60 more disciples, the nucleus of his monastic community, and then sent them forth as missionaries, while he himself returned to Uruvelā, where he made a thousand converts. Thence he proceeded to Rājagaha, the capital of the kingdom of Magadha (now the district South Bihar), gained the adherence of the King, Bimbisāra, as a lay disciple, and received from him a grove as a residence for himself and his followers. Not long afterward Gotama is said to have visited his native town Kapilavastu and to have received his own son Rāhula into the monastic order as a novice. After these first events the most trustworthy texts give no connected account of the 45 years of Gotama's public ministry, but it appears that he passed them in journeying through the eastern part of the Ganges Valley, teaching and preaching in each place, accompanied by a band of disciples. The rainy seasons he was accustomed to spend in some one of the «abodes» (*vihāras*) provided for the new community by generous lay adherents. His mission seems to have encountered little organized opposition, and the list of his chief disciples shows them to have been largely from the priestly Brahman caste and from the aristocratic and wealthy classes, including many members of his own family and clan. The two Brahmans Sāriputta and Moggallāna are mentioned as the leaders in the community after Gotama himself, but Ananda, his cousin, who was his personal attendant during the last 25 years of his life, seems to have been his most intimate and beloved companion. Another cousin, Devadatta, tried to create a schism in the community after having failed to supplant Gotama as its head, but had little success. The story also relates that he plotted Gotama's death with the help of the wicked king Ajātaśatru (who was afterward converted), but perished miserably himself.

When Gotama approached the age of 80, his health began to fail, but he continued his journeyings until the end. While on the way to Kusinārā, an ancient city on or near the Gandak River, he was seized with his last illness, a dysentery caused perhaps by eating pork, and expired in a grove near the city. His last exhortation to his disciples was that they should henceforth regard his doctrine and discipline as their master and should strive with earnestness. After his body had been burned with great pomp, the tradition says that the ashes were divided into eight parts and distributed as sacred relics, over which monumental mounds (*Stūpas*) were erected.

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CHARLES J. OGDEN, Ph.D.

BUDDHISM, one of the great religions of Asia, receives its name from its founder, Gotama the Buddha (see BUDDHA). According to Buddhist belief, all the doctrines and disciplinary rules of the religion were promulgated by the Buddha himself during his lifetime and were faithfully handed down by oral tradition for several centuries before being committed to writing; but Western scholars have shown that much of the contents of the sacred books must be subsequent to his time. The earliest complete records that we possess are the scriptures preserved by the Ceylonese Buddhists, which are written in the Pāli language and known as the Tipitaka (see PALI LITERATURE and PITAKAS). These date in their final form from the 1st century B.C., though their substance is much older. The Buddhists of northern India possessed from early times their own recensions of the canon, only fragments of which are extant, but these show no fundamental differences from the Pāli version. The later Buddhist works composed in India after the Christian era display a marked development in both legend and doctrine. The Pāli canon may therefore be taken as the best authority for early Buddhism, although it affords no certain means of distinguishing between the basic doctrines of Gotama himself and the scholastic expansion and classification of them by later minds.

Even in the oldest texts Buddhism appears as an elaborate system with a long array of technical terms, and its doctrines show an evident relationship with earlier Indian speculation, which from the polytheism of the Rigveda had advanced to the monistic or dualistic conceptions of the universe tentatively expressed in the Upanishads. From such sources Buddhism derived its world-weariness, its notion of rebirth in existence after existence, and its theory of *karma*, «the act,» namely, that a man's acts in one life are the cause of his lot in the next. The combination of these views results in the doctrine that all sentient existence is suffering continued through an endless succession of lives under the inexorable law of retribution. This is «The Noble Truth concerning Suffering,» the first of the «Four Noble Truths,» or cardinal doctrines, which Gotama is said to have enunciated in his first sermon, and which may almost surely be regarded as his authentic utterances.

The «Second Noble Truth,» concerning the origin of suffering, declares it to be «thirst,» that is, craving or desire, whether in a lower form for sensual enjoyments or in a higher for continued existence. Thirst, however,— and herein Buddhism shows the characteristic intellectualism of most Indian thought — is caused ultimately by ignorance. This doctrine is set forth in the important formula of the «Chain of Causation,» or «Wheel of Life,» the details of which are obscure, but in which Ignorance, Consciousness, Thirst, Birth and Suffering in its various forms are terms of the series.

The «Third Truth» declares that the cessation of suffering is brought about by the abandonment of desire. This brief statement is elaborated in other texts, which show that the emancipation is obtained through true knowledge, summed up in the sentence: «Whatsoever is subject to origination is subject to cessation.» This doctrine of universal impermanence, that all existence is merely a process of becoming without any substratum of permanent being, is the most distinctive tenet of Buddhism, which rejects the Upanishads' conception of an All-Soul. In regard to human personality Buddhism refuses to recognize an indestructible soul-entity and analyzes consciousness into a mere series of transitory states. Hence the knowledge both that all objects of desire are impermanent and that there is no personal subject to desire them leads to the destruction of desire itself. It is evident that this doctrine of the illusory nature of individuality is at variance with the inherited notions that the individual himself is reborn and reaps the consequences of his acts in a future life; but Gotama and his early disciples seem to have evaded the dilemma by dismissing all such questions as useless and improper. Whatever absolute reality there might be apart from the world of phenomena, they considered only the latter, i.e., the realm of suffering, and the means of escaping from it.

The «Fourth Truth» points out the path that leads to the cessation of suffering, the «Middle Way,» removed both from the life of sensual pleasure and from that of self-torture. It is the «Noble Eightfold Path»; namely, Right View (recognition of the truths about suffering), Right Intention (to renounce evil), Right Speech (abstaining from lying, slandering, reviling, and idle talk), Right Action (abstaining from taking life, from taking what is not given, and from carnal intercourse), Right Livelihood (not following a forbidden occupation), Right Effort (to avoid and put away evil states of mind, and to seek and cherish good states of mind), Right Mindfulness (self-possession that does away with longing and despondency), and Right Concentration (the four stages of ecstasy).

The goal of the Path is Nirvāṇa (Pāli *nibbāṇa*), a term which means literally «extinction» or «quiescence» and which denotes a state of perfect calmness and purity, in which the four great «taints» or «weaknesses,» sensual desire, longing for existence, vain theorizing and ignorance, have been destroyed. This blessed condition during life is, however, only the earnest of the «complete Nirvāṇa» (Pāli *parinibbāṇa*) into which the perfected disciple will pass at death. For such a one, who has abandoned all craving, there is necessarily no rebirth, no continuance in the world of phenomena; but concerning what lies beyond this world — whether nothingness or some inconceivable felicity — Buddhism, at least in its earlier stages, forbids us to inquire. The Teacher has revealed the way of emancipation from suffering; what he has not revealed, as being unprofitable toward salvation, is to be left uninvestigated on the part of the disciple.

In the early days of the Buddha's preaching, many persons are said to have attained complete purification (i.e., Nirvāṇa) soon after their conversion; but there arose in time a more elaborate classification of believers according to the degree of their religious attainment; namely, the convert (lit. «he who has entered the stream»), the «once-returner» (who will be reborn on earth only once), the «not-returner» (who will be reborn only in the highest heavens), and finally the Arhat (Pāli *arahat*, lit. «worthy one»), the perfected saint, who will be reborn no more. The spiritual discipline is partly a negative one, consisting in overcoming the soul-heresy and scepticism and attachment to outward works and ceremonies, in striving to suppress the great faults of sensuality, ill-will and mental error, and in destroying the four «taints» already mentioned. The positive discipline is first ethical,—the cultivation of virtue, and especially of the sentiments of friendliness, sympathy with others' joy and sorrow, and equanimity; then mystical,— the practice of ecstatic meditation in its four degrees (this not peculiar to Buddhism, but taken over from an early form of the «Yoga» system); and finally intellectual,— the attainment of supreme wisdom in the comprehension of the «Four Noble Truths.»

Thus far Buddhism would appear to be merely a system of self-discipline, but it shows a more distinctively religious aspect in its doctrine concerning the Buddha himself. The «Noble Truths,» although they are in accordance with reason, are not discoverable by the unaided intellect of the wisest man, but must be learned from a Supreme Buddha, a «completely enlightened one,» who is an omniscient being, endowed with various supernatural characteristics and powers, and superior even to the highest gods. This glorious eminence can be attained only by one who, as a Bodhisattva or «potential Buddha,» during countless existences on earth and in the heavens, has practised all the virtues with the firm resolution of becoming a Buddha, and who in the fullness of time descends from the Heaven of Delight, is born as a man, gains the supreme illumination, and preaches the Truths. At his death he enters into complete Nirvāṇa, and can then neither hear nor answer prayer (which indeed has no place in early Buddhism); but his memory is to be cherished by the faithful, and meditation upon it brings abundant profit.

Of the Supreme Buddhas, who appear only at long intervals, Gotama is the most recent and is consequently «the Buddha» par excellence; but even the earlier texts give the names of his six immediate predecessors and mention also his successor Maitreya (in Pāli, Metteyya), who will appear ages hence. In the younger Pāli texts the list of the Buddhas of the past is extended to 24 or 27 names. It is impossible as yet to determine how far this doctrine of the Buddha, or omniscient sage, is due to the Indian habit of deifying any great religious teacher, in this case Gotama, and how far it represents merely the centring of pre-existing mythological conceptions around his personality; but both processes have evidently been at work.

Buddhism also recognizes a class of «Individual Buddhas,» that is, men who have attained Nirvāṇa by their own insight, but who are not omniscient and who do not preach the Truths to others. Furthermore, there is a long array of supernatural beings, such as gods of various ranks, demons, terrestrial spirits and ghosts. Many of these are simply taken over from the popular beliefs of ancient India, and they are of slight importance in the orthodox doctrine, however much we may suspect that they were feared and worshiped by the mass of Gotama's adherents. In the cosmology of Buddhism these and all other sentient beings are distributed among 31 states of existence; namely, four formless or immaterial heavens, 16 heavens of pure form, six sensuous heavens, the worlds of men, demons, ghosts and animals respectively, and the realms of hell. Every such state, however, is limited in duration, by reason of the law of impermanence, and even the highest gods are subject to rebirth and degradation, unless through discipleship they attain Nirvāṇa.

The external organization of the Buddhist religion has always consisted chiefly in the institution known as the «Order» or «Congregation» (*sangha*), which is placed on an equality with the Buddha and the Law or Doctrine as one of the «Three Jewels,» or supreme objects of veneration. The mendicant life as an aid to religious training had been recognized by the Brahmans even before Gotama's time, and it was natural that he and his disciples should gradually develop it into a regular monastic order, especially as the following of the Path to the full extent involved the renunciation of ordinary worldly pursuits. The monk is therefore the typical Buddhist, and, as a rule, only the monk may hope to attain Nirvāṇa during this life.

Any man may enter the Order, regardless of his race or caste, unless he is disqualified physically, e.g., by a loathsome disease, or legally, e.g., by being a slave. The rules of discipline distinguish two stages in the monastic life, that of novice and that of itinerant mendicant (Sanskrit *bhikshu,* Pāli *bhikkhu*). A person becomes a novice by making a profession of faith, which consists in repeating three times the formula: «I take refuge in the Buddha, I take refuge in the Law, I take refuge in the Order,» and by assuming the monastic garb. He is then bound to observe the «Ten Precepts»; namely, to abstain from taking life, from taking what is not given, from unchastity, from false speaking, from using intoxicating liquors, from eating at forbidden times (i.e., between midday and the following sunrise), from worldly amusements, from using perfumes and ornaments, from using a high or broad bed and from accepting gold or silver. The full «initiation,» which could be given only to those who were 20 years of age or over, was effected by a formal vote of the chapter of monks. The rules of discipline required a monk to secure his food by begging, to possess no property but his three robes of reddish-brown or yellow rags, his alms-bowl, girdle, razor, needle and water-strainer, and to lodge either as a hermit in the forest or with a few companions in an «abode» (*vihāra*) near but not in a village or town. During the greater part of the year the monks usually traveled from place to place, but they were restricted to a fixed abode during the three months of the rainy season. Four times each month the monks of any given district assembled for the *uposatha,* a sort of sabbath-day observance, and twice a month on such occasions they listened to the recital of the *Pātimokkha* (Sanskrit *Prātimoksha*), a very old code of monastic discipline. These observances, together with a yearly ceremony of begging one another's pardon at the close of the season of retreat, constituted the simple ritual of the Order. Grave breaches of discipline were punished by expulsion, minor ones by penance or reprimand; and anyone who felt himself unequal to the monastic life might voluntarily return to the lay state.

Beside the Order or Congregation of monks stood that of the nuns (Sanskrit *bhikshuṇīs,* Pāli *bhikkhuṇīs*), which, according to the tradition, was instituted by Gotama rather unwillingly at the request of his aunt, who desired to renounce the world. The nuns were strictly subordinated to the monks in various ways and seem always to have been inferior to them both in numbers and in importance.

Outside the two branches of the Order and in no definite connection with them was the mass of lay disciples (*upāsakas*). No initiatory rite was required of these except the mere formula of «taking refuge» in the Buddha, the Law and the Order; and no special commandments were laid upon them except the observance of the first five of the «Ten Precepts» already mentioned, although it was considered meritorious for a layman to observe the sixth, seventh and eighth also, particularly on *uposatha* days. In practice the chief religious exercise of the laymen and laywomen consisted in supporting the monks and nuns by gifts of food, banquets, robes, dwelling-places and the like, and in listening to their preaching. The veneration of relics of the Buddhas, and of sacred trees and places, was also a form of worship on the part of the laity.

History of Buddhism.— For the first two centuries we have no trustworthy accounts of the progress of the religion. The sacred tradition, indeed, recognizes two «councils,» that of Rājagaha, held shortly after Gotama's death for the purpose of fixing the canon of discipline and doctrine, and the council of Vesālī, held a century later in order to settle 10 disputed points of discipline. In each case, however, the narratives of the proceedings are so filled with inconsistencies and impossibilities that they have little weight as history, although there is probably a basis of fact. With the reign of Aśoka (273–232 B.C.), the 3d emperor of the Maurya dynasty, we begin to have contemporary evidence for the spread of Buddhism; for the edicts of that monarch show that he became a convert and also a patron of the monastic order. Not only did he propagate the faith in his own dominions embracing the greater part of India, but he sent missionaries to the Himalayan regions, to the Greek rulers of the eastern Mediterranean, to southern India and perhaps to Burma. The most lasting result was the conversion of Ceylon, which was effected, according to tradition, by Mahinda, the Emperor's brother (or son). Ceylonese records also relate that a third council of the Church was held under Aśoka for the confutation of heresy, and his own edicts show that he took measures to prevent schism, a danger continually present in the loose organization of Buddhism. The Śunga dynasty, which overthrew the Mauryas in eastern India in the 2d century B.C., was hostile to Buddhism, but the religion made headway in the northwestern provinces under the Greco-Bactrian kings and was subsequently favored there by the great Indo-Scythian ruler Kanishka in the 1st century A.D. In his reign there was another general council, according to northern Buddhist accounts.

About the beginning of the Christian era there arose in Buddhism a new school of thought, whose members not only developed the original law of impermanence into a theory of the unreality of all things but, going beyond the ideal of attaining Nirvāṇa through sainthood, aspired to become Buddhas themselves by following the career of the Bodhisattvas, or potential Buddhas, and made devotion to Buddhas and Bodhisattvas conceived as personal divinities a prominent part of religion. This system they called Mahāyāna, «Great Vehicle,» as opposed to the Hīnayāna, «Little (or, Inferior) Vehicle,» of the older schools (see Mahāyāna). Different in spirit as the two Vehicles were, they continued to exist side by side in India as recognized divisions of Buddhism, although the kinship of the Mahāyāna with the Hinduism of the time is unmistakable. About the 6th century A.D. another school, that of the Tantras, or mystic formulas (see Tantra), sprang up, partly as an offshoot of the Mahāyāna, and partly as an accommodation of popular and often gross superstitions to the terms of Buddhist mythology. Thus Buddhism in India gradually abandoned its distinctive character and tended, from the 8th century onward, to merge itself in the surrounding Hinduism. There seems to have been little persecution by Brahmanical rulers, but the Mohammedan invaders and conquerors of northern India in the 12th century dealt a fatal blow to Buddhism in its original home by their destruction of the monasteries. From that time it rapidly declined, and for the last three centuries it has been practically extinct as a religion in India proper, although traces of its influence are discernible in the rites of certain castes. Only on the slopes of the Himalayas does it still partially maintain itself, though in a corrupted form. The Buddhism of the native state Nepal has a special historical importance, since its uninterrupted literary tradition has preserved many theological works that would otherwise have perished.

The great expansion of Buddhism northwards and eastwards began about the Christian era, when under the Indo-Scythian kings it spread from the valley of the Indus over the Hindu Kush and the Pamirs into Turkestan. Thence it was brought to China in the 1st century A.D., where it became firmly established in the course of the 4th century. China in turn transmitted the faith to Korea (384 A.D.), and Korea to Japan (552 A.D.). In the Far East, however, the Mahāyāna school early became predominant, and the history of the various Chinese and Japanese sects consequently is not within the scope of this article. In Tibet, which received Buddhism from India in the 7th and 8th centuries A.D., the Mahāyāna and Tantra doctrines were combined with the native superstitions and ultimately developed into the peculiar politico-religious system known as Lamaism. See Lamaism.

The Buddhists of Ceylon, on the contrary, have held fast to the more primitive teaching of the Hīnayāna, or «Little Vehicle,» through all the vicissitudes of their history, and this is still the principal religion of the island, although others predominate in the northern portion. From Ceylon or southern India the Hīnayāna was conveyed to Pegu in Lower Burma not later than the 6th century A.D., and in the 11th century it overcame the Mahāyāna in Upper Burma, gaining over the entire country a sway that it still maintains. Throughout Indo-China Mahāyāna Buddhism appears to have been early introduced by colonists from India along with the rival religion of Hinduism; but the Hīnayāna gradually advanced from the coast inland and has been supreme in Siam and Cambodia since about the 14th century. Buddhism also penetrated into Sumatra and Java but was supplanted by Mohammedanism in the course of the 14th and 15th centuries.

The Buddhism of the followers of Gotama, the so-called «Sect of the Elders» (*Theravāda*), consequently is found at the present day only in Ceylon and through the greater part of the Indo-Chinese Peninsula; but even in these countries the monks have deviated in many respects from the strictness of the ancient rule, and the mass of the laity, although paying a formal homage to the Buddha, the Law and the Order, are in fact more addicted in their daily lives to spirit-worship and other native superstitions.

Statistics.— In the British East Indian possessions, for which alone accurate statistics are available, there were, according to the census of 1911, 336,874 Buddhists in India proper, 10,384,579 in Burma and 2,474,170 in Ceylon. In Siam and French Indo-China the number of Buddhists is probably nearly 25,000,000. The Lamaistic Buddhists of Tibet, Mongolia, the Russian empire and the Himalayan states of Nepal and Bhutan may amount to 10,000,000 more; and a large proportion of the 400,000,000 people of China and Japan may be reckoned as Buddhists in a measure, although the interpenetration of Buddhism with other forms of religion in these countries makes it impossible to give definite figures.

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BUDDING, *in gardening*, the art of multiplying plants by causing the leaf-bud of one species (or, more commonly, variety) to grow upon the branch of another. The operation consists in shaving off a leaf-bud, with a portion of the wood beneath it, which portion is afterward removed by a sudden jerk of the operator's finger and thumb, aided by the budding-knife. An incision in the bark of the stock is then made in the form of a T; the two side lips are pushed aside, the bud is thrust between the bark and the wood, the upper end of its bark is cut to a level with the cross arm of the T, and the whole is bound up with netting or worsted, the point of the bud alone being left exposed. In performing the operation, a knife with a thin flat handle and a blade with a peculiar edge is required. The following conditions are essential to the success of the operation: First, the bud must be «ripe,» that is, fully formed — which is known by its plumpness and hardness. If too young, it will not succeed, because it has not acquired vitality enough to depend upon its own resources, until that new growth has taken place which attaches it to the stock. If too old, «sprung,» or beginning to grow, it is also unfit for use, because the new organs belonging to the young growth need an instant and uninterrupted supply of food, which in the beginning the bud cannot obtain from the branch. Secondly, the bark of the stock must «run freely,» that is, must separate readily from the wood below it. This separation is necessary in order that the bud may be inserted beneath the bark; and is always attended by the presence of a large quantity of the viscid matter called cambium, which is in fact a mixture of young tissue in the act of organizing and of organizable matter. The bud coming in contact with this substance, young and full of vitality, readily forms an adhesion with it, and thus the operation is complete. On this account young branches should always be chosen, since the bark never runs so freely, that is, there is never so great a collection of cambium under it in old branches. Those of the year in which the operation is performed are the best, provided they are advanced toward maturity. Shoots far advanced in a second year's growth are, however, often used, and with success. With regard to the time of performing the operation, autumn is preferred in this country, but it may be practised also in spring. Buds take better in autumn, because the stock has at that period ceased growing, and is chiefly occupied in storing up the organizable material required for the nutrition of the young organs, of which the bud, by the act of insertion, has become one. It ought to be borne in mind that the nearer the constitution of the stock approaches that of the bud, the greater is the success that attends this operation. If they are in any considerable degree dissimilar, the operation becomes precarious; if very different, it is impracticable.

In animals, a form of reproduction, as of the hydra, the sea-anemones, the coral polyps, ascidians, etc. The nature of the process due to rapid cell-division developed locally is best seen in the hydra (q.v.), where young hydras arise from protrusions, well called «buds,» from the side of the parent stock, and later are constricted off and become free individuals. In the corals, as a result of throwing out lateral buds from the base, arises a colony, or compound coral like most of the reef-building forms, such as the brain-coral (Meandrina). In the hydra and other animals the new individual arising by budding becomes free from the parent.

BUDDLEIA, bŭd-lē′yạ, a genus of about 70 species of shrubs or trees of the family *Loganiaceæ,* natives of the tropics and warmer temperate regions of the world. A few of the hardiest species, none of which are quite hardy in the northern United States, are cultivated as ornamental plants, for which purpose they are specially fitted by their attractive, usually deciduous, but sometimes almost persistent foliage and their clusters or racemes of tubular or bell-shaped flowers produced abundantly during the summer. The flowers, which in some species are fragrant, range in color from yellow to red, white, and purple, and in some cases have more than one color in individual flowers. They may be propagated from seed or cuttings and are found to thrive in well-drained soil in sunny situations. They are popular in the southern United States and the West Indies.

BUDÉ, bü-dā, **Guillaume**, French scholar more generally known under the Latin form Budœus: b. Paris 1467; d. 1540. He was royal librarian and master of *requêtes.* From his 24th year he devoted himself to study with the greatest zeal, in particular to *belles-lettres,* to mathematics and to Greek. Among his philosophical, philological, and juridical works, his treatise ‹De Asse et Partibus ejus,› and his commentaries on the Greek language, are of the greatest importance. By his influence the Collège Royal de France was founded. He enjoyed, not only as a scholar, but also as a man and citizen, the greatest esteem. His works appeared at Basel (1557). Consult E. de Budé, ‹Vie de Guillaume Budé› (1884).

BUDE (būd) **LIGHT**, an exceedingly brilliant light, produced by directing a current of oxygen gas into the interior of the flame of an argand-lamp or gas-burner, by which intense combustion is established and a dazzling light obtained. This plan of lighting was adopted in the House of Commons in 1840 and continued till 1852, when another system of lighting was introduced. It was invented by Mr. Gurney of Bude, in Cornwall, and hence the name.

BUDGE, Ernest A. Wallis, English Orientalist. He is a graduate of Christ's College, Cambridge. He has conducted important excavations at Aswân in Egypt, at Gebel Barkel, on the island of Meroe, and at Nineveh and Dêr in Mesopotamia. He is the keeper of the Egyptian and Assyrian antiquities in the British Museum, and, beginning with the publication of his ‹Assyrian Incantations› in 1878, has issued many important works on these subjects and translations from the ancient inscriptions.

BUDGERIGAR, the dealer's name for the Australian grass-parrakeet (q.v.). This small parrot has become a common cage-bird in all parts of the world, and goes by a great variety of names, among which «zebra,» «shell,» and «warbling grass-parakeet» are perhaps the most common.

BUDGET, the annual statement relative to the finances of a country, made by the proper financial functionary, in which is presented a balance sheet of the actual income and expenditure of the past year, and an estimate of the income and expenditure for the coming year, together with a statement of the mode of taxation proposed to meet such expenditure. The term «budget» is also applied to the periodical (usually yearly) statement of financial operations or plans of financing enterprises during a definite period, prepared by a responsible executive and submitted to the proper officials. See BUDGETS, AMERICAN; BUDGETS, FOREIGN.

BUDGETS, American. Under this heading will be described the national budget system adopted by the United States and also systems in effect in some of the states and cities throughout the country.

NATIONAL BUDGET.

The United States adopted the budget system on 10 June 1921, when an act of Congress putting it into effect was signed by President Harding. This Act, except for sections creating a General Accounting Office and a Bureau of Accounts in the Postoffice Department, became a law immediately and was the outcome of a long struggle to enforce a change in the government system of making appropriations. President Taft, during his administration, strived earnestly to secure the enactment of a Budget Bill, but Congress, exercising sole authority over governmental disbursements, steadfastly refused to surrender any of its privileges. However, the agitation was kept up and in May 1920 an act was passed which was vetoed by President Wilson on 4 June 1920 because of his belief that certain provisions therein made it unconstitutional.

The act of 1921 makes the President of the United States the real head of the Budget System though the actual work of preparing the budget devolves upon the Bureau of the Budget created by the measure and attached to the Treasury Department. This bureau is under the supervision of a director and assistant director, both of whom are appointed by the President, who also prescribes all rules and regulations for their guidance.

The law provides that the President shall transmit to Congress on the first day of each regular session a budget in which he shall set forth (a) his estimates of the expenditures and appropriations necessary for the support of the government for the ensuing fiscal year; (b) his estimates of the receipts of the government during the ensuing fiscal year not only under existing laws but also under any revenue measures he may propose; (c) an estimate of the expenditures and receipts of the government during the last completed fiscal year; (d) an estimate of the expenditures and receipts of the government during the fiscal year in progress; (e) the amount of annual, permanent, or other appropriations, including balances of appropriations for prior fiscal years, available for expenditure during the fiscal year in progress; (f) balanced statements showing the condition of the treasury (1) at the end of the last completed fiscal year, (2) its estimated condition at the end of the fiscal year in progress, and (3) its estimated condition at the end of the ensuing fiscal year, if the financial proposals contained in the budget are adopted. He must also furnish essential facts regarding the indebtedness, bonded or otherwise, of the government, and recommend ways and means for increasing or decreasing revenues if increases are needed or decreases are deemed advisable. The President is given the right to transmit such supplemental or deficiency estimates for appropriations as are necessary to take care of deficits arising under laws enacted after transmission of the budget, or otherwise. All estimates for lump sum appropriations must be accompanied by detailed statements. Under the law estimates for the legislative branch of the government and the Supreme Court of the United States must be transmitted to the President on or before 15 October of each year and shall be included by him in the budget without revision. The director and assistant director of the Bureau of the Budget receive salaries of $10,000 and $7,500 a year respectively. The director, subject to the approval of the President, appoints all the employees of the bureau and fixes their compensation. No appointee of the director, however, shall receive more than $6,000 a year and not more than four shall be paid a salary in excess of $5,000 a year. All employees receiving $5,000 a year or less are appointed in accordance with the Civil Service laws and regulations.

Under such regulations as may be prescribed by the President, every department and establishment is required to furnish to the budget bureau such information as it may from time to time require. The head of each department and establishment must designate an official thereof as budget officer therefor, who, in each year, under his direction, shall prepare the departmental estimates. Departmental estimates so prepared must be revised by the departmental heads and submitted to the Budget Bureau for its revision on or before 15 September of each year.

Shortly after signing the budget bill, President Harding appointed Brig.-Gen. Charles G. Dawes, one of the best-known bankers of Chicago, as the first director of the Bureau of the Budget.

The sections of the Budget Act, creating the General Accounting Office, went into effect 1 July 1921. It abolishes the old offices of Comptroller of the Treasury and Assistant Comptroller of the Treasury and creates in their stead the positions of Comptroller-General and Assistant Comptroller-General of the United States. The former is the head of the General Accounting Office upon whom is imposed most of the duties previously performed by the Comptroller of the Treasury, the six auditors of the Treasury Department, and the Division of Bookkeeping and Warrants of the Treasury Department. Both the Comptroller-General and Assistant Comptroller-General are appointed by the President, with the advice and consent of the Senate, hold office for 15 years and receive salaries of $10,000 and $7,500 a year, respectively. The Comptroller-General is ineligible for reappointment. Either he or the Assistant Comptroller-General may be removed at any time by joint resolution of Congress for permanent incapacity, inefficiency, neglect of duty, malfeasance in office, or for the commission of any felony or for conduct involving moral turpitude, but for no other cause and in no other manner except by impeachment. The General Accounting Office is independent of any of the executive departments.

Upon the Bureau of Accounts in the Postoffice Department, created by the act, is imposed the duties previously performed by the auditor of the Postoffice Department. It is under the direction of a comptroller, appointed by the President, with the advice and consent of the Senate, whose salary is fixed at $5,000 a year. The section of the law creating this bureau also went into effect 1 July 1921. For other National Budget Systems see BUDGETS, FOREIGN, NATIONAL.

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STATE AND LOCAL BUDGETS.

Provisions and Procedure in States.— As a whole American States and cities have no uniform budget system and in their practice in this particular vary considerably. Every State in the Union has a provision that the governor «from time to time» or «at every session,» or «at every regular session» shall give the legislature information on the condition of the State and make recommendations. Colorado, Idaho, Illinois and Kansas require that he shall «recommend measures.» But no governor assumes to have any standing before the State legislature until a bill is passed. Alabama, Colorado, Idaho, Illinois, Missouri, Montana, Nebraska, Texas and West Virginia require that on the opening of each regular session the governor shall present estimates of the amount of money to be raised by taxation, but no governor would construe this as meaning that he should prepare and submit a «budget.» Maryland adopted a budget system in 1916, under which the governor submits to the legislature a detailed budget which the latter may reduce or reject, but may not increase. The South Dakota constitution requires a two-thirds vote of the legislature to pass a special appropriation; the general appropriation bill passes by majority vote. In 1912 Wisconsin undertook to effect a plan of developing the State budget as a joint measure of the legislature and the administration. In 1913 New York established a State board of estimate so as to interject in its budget procedure a means of central control. The board consisted of the governor, lieutenant-governor, president *pro tempore* of the senate, chairman of the senate finance committee, speaker of the assembly, chairman of the assembly ways and means committee, controller, attorney-general, commissioner of efficiency and economy, four members ex officio of the legislative branch and five members ex officio of the executive and administrative branches. The first year the estimates came before the board it was unable to reach any conclusion and made no report, except such as was submitted individually by two members.

The question has aroused much popular unrest and in recognition of the dissatisfaction several States have appointed commissions or committees to inquire into methods of securing greater efficiency and economy in conducting the State business. Such commissions were appointed by Massachusetts and New Jersey in 1912 and by New York, Pennsylvania, Minnesota, California, Illinois and Iowa in 1913, most of them recommending methods of ridding the States of irresponsible government. In the revised constitution of New York that was rejected in the election of November 1915, the financial methods were grouped round the budget idea. In California a State board of control has taken over the general supervision of the business and financial affairs of the State, with absolute control of the expenditure of the appropriations made by the legislature, and in 1915 the legislature took further steps to perfect the budgetary machinery. In 1913 the Illinois legislature passed an act providing for the preparation of a budget by the legislative reference bureau which was submitted to the session of 1915 and revealed the lack of correlation in the different departments and the lack of uniformity in compensation and in matters of accountancy. On 6 May 1913 an act was approved by Governor Cox of Ohio «to establish a budget system for the State officers, departments, and institutions,» requiring that on or before 15 November, biennially in even numbered years, all State activities requiring appropriations should submit to the governor a statement of their wants for the next biennium, which estimates should be submitted at the beginning of each regular session of the general assembly. Only two States require that appropriation bills originate in the lower branch of the legislature, while not half of the State constitutions provide that bills for raising revenue shall originate in the lower house. In some States no appropriation bill may contain more than one item. In some States a date is set, after which no appropriation bills may be introduced, while some provide that it may be done on unanimous consent. Wisconsin provides that in order to consider a revenue bill three-fifths of the members must be present to constitute a quorum. South Dakota requires a two-thirds vote to pass an appropriation bill. Other constitutions prohibit appropriations of money in excess of revenues provided; others forbid the expenditure of public money for institutions outside the control of the State or for religious purposes.

In most legislatures the appropriation and revenue bills are in the hands of separate committees, though in a few States the same committee has charge of both. Other committees may report bills providing appropriations, but these bills must be referred to the regular appropriations committee which finally decides the matter. In most States the various executive officers are consulted by the committee before presenting appropriation bills and to a large degree committees defer to the information given them by the State auditor or some specially designated official in his department. But as many State legislatures do not meet annually it is necessary to frame budgets two or three years in advance, and as revenues are bound to fluctuate there can be no orderly financial procedure.

County Budgets.— In the county budget the board of supervisors or county commission or tax-levying authority must provide for two classes of expenditures and may provide for a third class. The first class includes items over which the county authorities have no power, such as taxes levied by the State in the county, court judgments against the county, salaries established by legislative enactment and similar items. The second class includes items over which the tax-levying authority has discretion as to the amount. The third class includes expenditures over which the tax-levying authority has complete control both as to their existence and their amount. In New York there is a law which empowers the State controller to prescribe a uniform scheme of appropriations for all the counties of the State but he has no means to enforce its adoption or use. Indiana has an accounting law which prescribes budget estimates by each department head but as in the New York plan many of the essentials of a complete budget are lacking, such as a balance sheet, a working plan, a statement of estimated funds available for budget purposes in the reduction of taxation, etc. The new charter of Los Angeles County, Cal., has made a great advance in budgetary provisions. In Westchester County, N. Y., the heads of departments submit in advance requisitions for all the needs during the fiscal year; these requisitions are passed upon by the finance committee and the budget is then prepared and submitted to the board of supervisors with the estimates of municipal receipts. Ontario and Monroe counties, N. Y., have greatly improved their budgets and the latter has established a bureau of municipal research.

City Budgets.— In some cities the council or board of aldermen prepares the budget while in others this work is done by the board of estimate and apportionment. Under the council plan the estimates of the various departments are submitted to the municipal legislative body, are referred to and discussed by the proper committee, and then, after action by the council, submitted to the mayor for approval or veto. Under the Philadelphia charter the controller is the only one permitted to submit estimates to the aldermen and no one is required to assume responsibility for a definite financial plan or proposal for the next fiscal period. The controller is forbidden to make payments under any appropriation bill unless the total appropriations have been brought within the estimated revenues. New Orleans provides that appropriations must not exceed 80 per cent of the estimated revenues. Under the charter adopted in 1912 the mayor of Cleveland prepares the preliminary budget from the departmental estimates, though in practice this is prepared for him by the city director of finance. He may change any item but must not increase the total. The revised estimates are then submitted as a basis to the council which has full power to increase, decrease, reapportion or reject items in the mayor's estimate. The estimate must go to the council by the middle of November, and the appropriation ordinance prepared «at once.» This is printed for general distribution and public hearings must be held, either before the regular appropriations committee or before the council sitting as a committee of the whole. The committee's report is then printed in the city record with a separate schedule setting forth the items asked for in the mayor's estimate and rejected or changed by the council and the reasons for such rejection or change. The council cannot pass the ordinance until 15 days after its publication or before the first Monday in January. In Illinois a State statute requires that each municipality shall pass an annual appropriation bill during the first quarter of the fiscal year. In Chicago the practice has been to pass the budget late in January or early in February, but during the course of the year numerous supplemental appropriations are made. All appropriations are made by the council with the mayor's approval, he having also a veto power over specific items contained in the appropriation bills, which veto may be overridden by a two-thirds vote. The controller revises the preliminary estimates of the departmental needs, and transmits them to the finance committee of the council, comprised of 15 members. After about two months of consideration and public hearings this committee refers the budget to the entire council which usually passes it substantially in the form submitted.

In many of the large cities the preparation of the budget rests with the board of estimate and apportionment, which apportions the estimated expenditures among the various municipal departments. This plan was adopted in New York in 1871, not as a measure of more scientific and honest government but in the interests of the Tweed ring. Under its new charter of 1897 the board consists of the mayor, controller, president of the board of aldermen and the five borough presidents. The first three have three votes each, the borough presidents of Manhattan and Brooklyn two each and the other borough presidents one each. The department estimates are sent to this board and duplicates to the board of aldermen. Having made its budget (or more strictly its appropriation bill) based on these reports, the board of estimate must within five days submit it to the board of aldermen, which within 20 days must have completed its discussions and have taken final action. The aldermen cannot increase the budget nor insert new items but may reduce it, though reductions are subject to the mayor's veto, which can be overridden only by a three-fourths vote. After the amount of the budget is definitely fixed authority is given to raise this sum by taxation and 3 per cent may be added to provide against loss in the collection of the levy. In actual practice the city votes expenditures before it levies its tax so that for six months revenue bonds in anticipation of taxes must be issued in order to carry on the government, but recently the city has instituted semi-annual payments of taxes and does not deduct interest if paid promptly but adds interest if unpaid after a certain date. Every year a considerable amount of the taxes is unpaid (the uncollected balance of deficiencies written off on the real property tax averaging 6 per cent, so that the net collections are about 94 per cent of the total levy, while of the personal property tax only about 70 per cent is collected) and provision for the deficit occasioned thereby is made in succeeding budgets. In 1915 the city began the «pay-as-you-go» plan of financing. Baltimore and Detroit also have boards of estimate. The former city forbids its officials to make up deficits by temporary loans but directs that such deficiencies be offset by pro rata reductions in the departmental appropriations. Detroit's board of estimate is entirely separate from the executive departments, since it consists of two members elected by each ward and five members elected at large. In this city the council considers the budget first and then submits it to the board of estimate which has the discretionary power to reduce any item of the appropriation bill or the rate of taxation. See Municipal Accounting.

Nearly 50 cities of the United States have adopted the commission manager form of government, which, as regards the budgetary provisions of their charters, may be divided into two groups — Dayton, Ohio, comprising one and the remaining cities the other. The charters of the latter merely provide that at a certain time each year the commission shall cause to be prepared or that the manager shall prepare a list of receipts from all sources and detailed estimates setting forth the necessary expenditures for all purposes for the ensuing year. Although most of these budgets are unscientific in form, they seem to work out satisfactorily in practice. Since 1 Jan. 1914 Dayton has been operating under a commission manager charter which provides that on or before 1 November of each year the city manager shall submit to the city commission an estimate of expenditures and revenues for the ensuing year, which estimate is to be based on information furnished by the several departments. Prior to submission the manager has reduced the total request to within the estimated income for that year. The commission then reviews the budget with the manager, receives his explanations for the recommendations made and makes such changes as it sees fit. The manager is the head of the administrative branch of the government and alone is responsible for operation of the various departments. Since the department heads are responsible to him and removable by him the city manager controls the expenditures and he is kept in close touch with the work of each department and with the adequacy of funds by frequent cabinet meetings. Thus he is in a position to make curtailments and to recommend increases as the occasion presents itself and the system is removed from the old log-rolling and personal consideration in appropriating funds. City business as in fact all governmental business — national, State and local — is a matter of dollars and cents and not of bosses and parties; administering a city is a specialized business requiring specialists just as much as the largest of our great corporations. See PUBLIC FINANCE; CITY MANAGER.

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BUDGETS, Foreign, National.— Most of the main features of the European budgets are similar. Each department of the government submits a detailed statement showing the object and amount of expenditures for the preceding year and an itemized estimate of expenditures for the next year. These estimates are coordinated by the ministry of finance, which assumes an especially effective control in Great Britain. The ministry, assisted by the revenue collecting bureaus, estimates the yield of existing sources of revenue and if the estimated expenditures exceed the revenues a way must be found either to reduce the expenditures or to provide means of increasing the revenues. In Austria, Hungary, Belgium, France, Holland, Russia and Switzerland the budget goes into effect on 1 January; in Denmark, Germany, Great Britain, Norway, Prussia and Sweden on 1 April; in Italy, Portugal and Spain on 1 July. Great Britain and the countries that follow her practice leave a comparatively short interval between the preparation and enforcement of the budget, but France allows from 13 to 15 months. The British budget accounts only for actual receipts and expenditures within the fiscal year, and is divided into the permanent «Consolidated Fund» (which includes about one-sixth of the expenditures and four-fifths of the revenues, but does not require the annual vote), and the «Supply Services» which are adjusted annually. In Belgium and France there must be yearly votes on revenues and expenditures, while Germany has yearly budgets that contain complete estimates, but the Parliament has little more than new proposals to adjust. In most continental states the budgets are divided into ordinary budgets, which include the items of annual recurrence, and extraordinary budgets that take in unusual expenditures to be met by loans or other unusual revenues.

In Great Britain the Crown has the sole right to initiate expenditures. The House of Commons may reduce but it cannot increase the estimates, while the Lords have not even the power to amend — they must either accept or reject the whole budget. No items of extraneous nature may be attached to the budget (see GREAT BRITAIN, PARLIAMENT). Many of the European constitutions require that finance bills originate only in the lower house, but most continental legislative bodies have less direct influence on the budget than the British. In the British Parliament the budget is discussed in committee of the whole House, decisions being formally adopted later by the House. Here committee action is representative, responsible and decisive, while the reverse is true of continental committees. In Great Britain a small deficit or unexpected expenditure is met by a «supplementary estimate» in the budget, while in the case of an emergency, such as war, expenditures are authorized by a «vote of credit.» In continental states such emergency requirements are met by additional credits or supplementary budgets. Sometimes the passage of the budget is so delayed that the fiscal year is well under way before departmental funds are available, in which case it is usual to provide for current expenses by provisional grants. In Great Britain there are numerous checks on the use of funds. Money can be expended only in the amount and for the object specified, and while it is very unusual to transfer balances between «votes,» such transfer is permissible within the same department for army and navy. There is a special auditing department, as also in France, directly responsible to Parliament, that controls the disbursements and audits all accounts, thus assuring an accurate execution of the budget.

City Budgets.— In considering German municipal budgets it should be remembered that the empire comprises 26 more or less independent states, each having its own legislative body, administrative officials, political subdivisions and system of local government. The financial relations between the local and general governments are very complicated, since every taxpayer contributes either directly or indirectly to several governmental organizations: (1) The empire, (2) the state, (3) the province, (4) the government district, (5) the circle and (6) the commune, of which there are two kinds — rural and urban. The income tax is a source of both state and municipal revenue, while the unearned increment tax, introduced into Frankfort in 1904, was adopted by the imperial government in 1911. Under the law this tax should be collected and administered by the various states and the proceeds divided between the imperial, state and municipal treasuries, but in practice the tax is collected by the municipal governments which, with the state's sanction, may levy a supplemental unearned increment tax not to exceed 100 per cent of the imperial tax. Hence the policy of one state may not be the policy of all. While the finance administration of both the empire and the state is carried on by a division of the respective ministries of finance, the cities have no special municipal budget commission or board of estimate, every phase of budget-making being in the hands of the regularly constituted city officials.

Under Prussian laws a city may plan its budget for one, two or three years, but as a rule it is done yearly, the financial year beginning 1 April and ending 31 March. The various departments present their estimates of revenues and expenditures to the magistrate (the administrative board which controls and directs the city government, prepares the business for the council, supervises municipal enterprises, has custody of revenues, etc.), which makes the annual estimate not later than 1 January preceding the fiscal year. After public examination and criticism for eight days it is formally presented to the city council whose approval is necessary before it becomes the established budget. When the preliminary estimate is made, a copy is sent to the authorities superior to the municipality, but their sanction, which the law requires, is necessary only if new taxes are imposed or old ones changed. If the superior authorities do not object and the city council approve, the estimates become the budget for the fiscal year following. Special budgets may be passed if unforeseen events demand the raising of more revenues, but these occasions are few. The forms and details of a municipal budget are not prescribed by general law, but the main features are as follows: The municipal budget consists of two general classes of minor or subsidiary budgets: (1) those which either increase or decrease taxation, and (2) those which do not, such as savings bank budgets, foundation budgets, etc. Each of these general classes is again divided into two heads — ordinary administration and extraordinary administration; then follow the minor subdivisions or special items of administration from which the original or primary estimates are made; that is to say, before the general budget is drafted its makers must know the needs of the ultimate administrative divisions though in order of presentation the general budget precedes the separate estimates. The ordinary part of the budget includes regular current income derived from communal property, taxes and exemptions, dues, fees, etc., and the portion granted to the municipality by the state, province and circle. The extraordinary part includes receipts from special or exceptional sources, such as legacies, gifts, loans, sales of land, etc. There is no state audit of local finance in Germany, but a «revision» of the local treasury is made by the executive every month on specified days and at least once a year a «surprise revision» is made when no notice is given. Further control of the budget is provided by requiring the magistrate to keep and publish a register of municipal property, both real and personal.

The methods pursued in British and French cities are in marked contrast, since the British municipality is practically autonomous (even the small measure of control exercised by the central authorities, the Local Government Board and the National Exchequer, being conceded grudgingly), while in France a large measure of local control has been sacrificed to the efficiency of centralized authority. English cities may exercise only those powers expressly granted them by Parliament and accordingly constantly petition for special acts granting additional powers. The English mayor is a figurehead, the town council possessing the chief powers and doing the bulk of the work through its committees. The finance committee is held to strict account for the finances of all committees; it negotiates all loans, invests sinking funds, prepares the annual financial statement and manages the tax collections. Through it must be made all warrants for payment of authorized appropriations. It acts as a consultative committee on rate estimates, conferring with other committees as to financial needs for the following year, revising their estimates, and then presenting the completed statement to the council, together with the precept (tax rate) deemed necessary to meet the estimated expenditures. Though the finance committee presents the estimate the several committees of the council are responsible for the expenditures with regard to the purposes entrusted to them and are expected to keep the expenditures within the amount allowed by the council. The manner of levying the rate varies in different cities. Leeds has a city rate, a consolidated rate and a highway rate levied by town council, besides which there is a poor rate levied by the overseers of the poor, but all are collected in one. Birmingham levies but one, the borough rate, covering the whole expenditure of the corporation which can be charged on the rate, though there is an additional poor rate to meet expenditures entailed by the poor law proper.

In the French city the mayor prepares the budget for the council's consideration at the May meeting, this being known as the original budget, which may be succeeded toward the close of the year by a supplemental budget. The receipts are denominated ordinary (stable and permanent) and extraordinary (irregular and occasional); the expenditures are optional and obligatory, the former resting in the discretion of the local authorities — in the mayor, if he can influence the council sufficiently. Obligatory expenditures must be met out of established income, and if not adequately provided for, the higher authorities make forcible provision by *inscription d'office* or official entry upon the budget. Cities with annual receipts of less than $750,000 must submit their budgets to the prefect of their department; those with revenues above this sum are subject to the ministry of the interior, representing the president of the republic. Should the mayor and council prove obstinate regarding obligatory expenditures they may be suspended from office by the central authorities. When approved, the French budget cannot undergo the slightest alteration. When additional expenditures are found necessary they are incorporated in the supplementary budget, drawn up by the mayor and considered by the council at the May session of the year to which it applies — that is, a year after the budget whose transactions it completes. In this budget no obligatory expenditures appear as they have been cared for in the regular budget. If the contemplated expenditures do not appear warranted to the higher authorities they may be rejected or reduced by a decree of the President or by a resolution of the prefect in charge of the department, but these authorities are not permitted to increase expenditures or to introduce new ones.

In England the system of audits is perfunctory and not taken seriously in the large cities, since there are three auditors, each acting independently and serving without pay. Hence some cities employ salaried professional accountants. In France, however, there is a National Court of Accounts which surveys and audits the whole of the accounts of national revenue and expenditure of the departments (provinces) and of all towns, districts and public institutions having an annual revenue exceeding $7,500. Towns below this limit send their accounts to the prefectoral council for audit.

Canadian cities have been revising their budgetary practices. In 1913 Toronto formed a Civic Survey Committee which consulted with the New York Bureau of Municipal Research to ascertain defects and suggest remedies. The report of the committee has been made, but up to 1918 no drastic changes had been made and hence the methods pursued are about the same as before, though the tendency is gradually to fix the responsibility more clearly. At present the estimates are made out by the heads of departments and submitted to standing committees, resubmitted to the board of control and submitted by them, amended, to the council, who pass the final estimates. The word «budget» is not officially used in connection with the Toronto city government. The council attempts to control expenditure by passing vouchers before payment; its tendency, owing to lack of details supporting the estimates, is to over-estimate income and under-estimate expenses for the purpose of keeping down the tax rate, which process results in a deficit.

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Irving E. Rines,
Author of ‘History of the United States.’

BUDWEIS, bood'vīs (Czech Budejovice), a town of Bohemia, on the navigable Moldau, 133 miles northwest of Vienna by rail. It has a cathedral with a detached belfry dating from about 1550; manufactures of stoneware, porcelain, machines, lead pencils, saltpetre, etc., besides a brisk trade in grain, wood, coal and salt. In its many educational institutions, including two gymnasia, high, agricultural, trade, industrial and other schools, instruction is given in both German and Bohemian. In the neighborhood is Schloss Frauenberg (1840–47), the seat of Prince Schwarzenberg. Pop. 39,400.

BUEL, Clarence Clough, American editor and author: b. Laona, Chautauqua County, N. Y., 29 July 1850. He was connected with the New York *Tribune* from 1875 to 1881, when he joined the staff of the *Century Magazine*, and, in 1883, in conjunction with Robert Underwood Johnson, began the editing of the celebrated ‘Century War Articles,’ which were afterward expanded into the notable ‘Battles and Leaders of the Civil War’ (1887). Associate editor of the *Century Magazine* 1909–13; advisory editor until May 1914.

BUEL, Samuel, American clergyman: b. Troy, N. Y., 11 June 1815; d. New York, 1 Feb. 1891. He was graduated from Williams College in 1833 and from the General Theological

Seminary, New York, in 1837. He was rector successively in Marshall, Mich., Schuylkill Haven, Pa., Cumberland, Md., Poughkeepsie, N. Y., and New York until 1866. From 1866 to 1869 he was professor of ecclesiastical history in the Seabury Divinity School, Faribault, Minn., and professor of divinity there 1869–71, when he was elected to the chair of systematic divinity and dogmatic theology in the General Theological Seminary, a position which he held until his retirement as professor emeritus in 1888. He wrote ‹The Apostolical System of the Church Defended, in a Reply to Dr. Whately on the Kingdom of Christ› (1844); ‹Eucharistic Presence, Sacrifice and Adoration› (1874); ‹A Treatise of Dogmatic Theology› (1890), and translated F. H. Reusch's ‹Conference at Bonn: Proceedings, August 1875, Between Old Catholics, Orientals, Members of the Anglican and American Churches, from Europe and America› (1876).

BUELL, Don Carlos, American military officer: b. Lowell, Ohio, 23 March 1818; d. near Rockport, Ky., 19 Nov. 1898. He was graduated at West Point in 1841 and served with distinction in the Mexican War under Generals Taylor and Scott, being severely wounded and promoted twice for gallant and meritorious conduct. When the Civil War broke out he was adjutant-general in the regular army, having been promoted to the rank of lieutenant-colonel in the adjutant-general's department, 11 May 1861. On 17 May 1861, he was appointed brigadier-general of volunteers; from 20 May to 9 August was on duty in California, and from 14 September to 9 November assisted in preparing the army at Washington. On 15 Nov. 1861, he succeeded Gen. W. T. Sherman in command of the Department of the Ohio, which was then enlarged so as to include the States of Ohio, Indiana and Michigan. For two months he was occupied in organizing his department and accomplished little in a military way until February 1862. Grant, following Buell's plans, had captured forts Henry and Donelson, thus causing the Confederates to abandon Bowling Green and Columbus and to evacuate Nashville, Tenn., and on 24 February Buell formally received the surrender of the latter city. On 21 March he was made major-general of volunteers, his department at the same time being merged into the Department of the Mississippi, then in charge of Gen. H. W. Halleck. Meanwhile Grant had begun his operations at Shiloh or Pittsburgh Landing (q.v.), expecting that Buell would join him at his leisure, but the Confederates had planned to surprise Grant before Buell's arrival and accordingly marched from Corinth on 3 April and attacked early on the morning of 6 April. Grant's troops were being driven back gradually to the landing when, toward evening, part of Buell's army, which had marched through the swamps from Savannah, appeared on the field and checked the Confederate onslaught. The next day, the remainder of his army having arrived, Buell aided Grant to force the exhausted Confederates in full retreat back to Corinth, thereby saving Grant from a disastrous defeat. On 11 April, General Halleck arrived and took supreme command of the Union forces, then numbering 100,000 effective troops, and placed Buell in command of the centre wing of the reorganized army. In this capacity he participated in Halleck's campaign against Corinth (q.v.), which was captured 30 May and where he remained until 10 June, when, as commander of the Army of the Ohio, he moved northward to checkmate Bragg's designs on Kentucky. Early in September Bragg started for Louisville and, closely pursued by Buell, reached that city first, but owing to lack of provisions was compelled to relinquish the city to Buell, who arrived 25 September. There Buell was reinforced by 30,000 raw soldiers, raising his army to nearly 100,000 troops. Accordingly on 1 October, taking 58,000 troops, he left Louisville to pursue Bragg, and on the 8th overtook and defeated his army of 16,000 troops at Perryville (q.v.), compelling him to retreat from Kentucky by way of Cumberland Gap. Some assert that Buell should have pushed the pursuit with more vigor and that his dilatory tactics permitted Bragg to reach safety. However that may be, on 24 October, by Halleck's order, Buell was relieved of command and on the 30th was superseded by General Rosecrans, the army then being designated as the Army of the Cumberland. In November a military commission was appointed to investigate his conduct of the campaign in Kentucky and Tennessee, the hearings continuing until May 1863. The commission rendered a report adverse to Buell and in reply the latter subsequently published his ‹Statement of Major-General Buell, in Review of the Evidence before the Military Commission Appointed by the War Department in November 1862.› Though Grant endeavored to entice him into active service again, Buell refused all further assignments, on 23 May 1864 resigning from the volunteer service and on 1 June also resigning his commission in the regular army. From 1865 to 1870 he was president of the Green River (Ky.) Ironworks, afterward engaging in coal mining, and from 1885 to 1889 served as United States pension agent at Louisville. Consult ‹Battles and Leaders of the Civil War› (New York 1884–88); Cist, H. M., ‹The Army of the Cumberland› (New York 1882); Fry, J. B., ‹Operations of the Army under Buell› (New York 1884).

BUEN AYRE, bwān ī'rā, or **BONAIRE,** a small island off the coast of Venezuela, belonging to the Dutch. It is 50 miles in circumference and inhabited chiefly by Indians, with a small mixture of Europeans; mountainous; producing a few cattle, goats, large quantities of poultry and a considerable quantity of salt. It has springs of fresh water. On the southwestern side is a good harbor. Pop. 4,926.

BUENA VISTA, bwā'na vēs'tä, a village of Mexico, seven miles south of Saltillo, where, on 22–23 Feb. 1847, about 4,700 United States troops, under Taylor, defeated 20,000 Mexicans under Santa Anna. The American army engaged at Buena Vista consisted in large part of volunteers, most of whom had no military experience, and on account of the unequal daring and composure displayed by them at different times the battle would have been lost again and again but for the heroic conduct of the regular artillery. The Americans had taken a strong position on the 21st and were attacked on the 22d, though the main battle did not begin till the 23d, continuing with only slight intermission throughout the day. Santa Anna's attacks were successfully repulsed and on the 24th he was compelled to retreat. The American losses were 696 killed and wounded and the Mexican about 2,000. This battle practically closed the campaign in the north. See MEXICAN WAR. Consult Carleton, ‹The Battle of Buena Vista› (1848); Howard, ‹General Taylor› (1892).

BUENA VISTA, Va., city in Rockbridge County, 40 miles northwest of Lynchburg, on the Chesapeake and Ohio and the Norfolk and Western railroads, and on the North River. The Southern Seminary for Girls is located here. The city has iron foundries, fertilizer works, leather works and a pulp factory. The city owns the waterworks. Pop. (1920) 3,911.

BUENAVENTURA, bwā-nạ-vĕn-tū'rạ, a seaport of Colombia, on the Bay of Choco, on a small island at the mouth of the Dagua, 200 miles southwest of Santa Fé de Bogota. It is the port of Santa Fé Bogota, Popayan and Cali, and is considered one of the most advanced cities in the Republic. Its location on the Pacific Ocean, contiguous to the Panama Canal makes it the most important trade centre and port of entry for all the western region of Colombia. The city is well built but the harbor is lacking in many facilities for docking, loading and unloading vessels. The government, however, is taking measures to provide these through the construction of piers and warehouses.

BUENOS AIRES, bwā'nōs ī'rās, one of the provinces of Argentina, lying west of the La Plata and Atlantic Ocean, and separated from Patagonia by the Rio Negro. The chief rivers are the Paraná, with its tributary, the Plata River, and the Rio Salado. The province presents nearly throughout level or slightly undulating plains, known as the Pampas of Buenos Aires. They are covered with tall, waving grass, which affords pasture to vast numbers of sheep, cattle and horses. These constitute the chief wealth of the inhabitants, and their products, along with wheat, are the chief exports. The climate is generally healthful. For judicial purposes the province is divided into four districts, and for administrative ones into 100. The capital is La Plata. The executive power resides in a governor and vice-governor, indirectly elected for three years, and the legislative power in a Congress, composed of a Chamber of Deputies of 100 members, biennially elected, and a Senate of 50, elected biennially. The Congress sits from 1 May to 31 August. Pop. about 1,500,000.

BUENOS AIRES, Federal capital and principal port of importation and exportation of the Argentine Republic, and the largest of all the cities of the southern hemisphere. From its population (estimated at 1,700,000 on 1 Jan. 1917) it occupies the second place among the Latin cities of the world, coming directly after Paris. It is situated in lat. 34° 36′ 21″ S., which in the northern hemisphere corresponds to the latitudes of Los Angeles, Cal., and Yokohama, Japan; its longitude is 58° 21′ 33″ west from Greenwich; it is built, 65 feet at the highest point, above the level of the sea, upon the right bank of the La Plata River, which is here about 30 miles wide, and distant 172 miles from its mouth where it empties into the Atlantic Ocean. It is the metropolis, commercially, politically and socially, of the extreme southeastern portion of the continent. Distant 5,220 miles from London and 4,370 miles from New York, it is the terminal port for 10 transatlantic lines of steamships which unite it with European ports, and it is also the centre from which radiate 6,600 miles of railroads, which end in Patagonia in the south, and in the west and north connect it with the frontiers of Chile and Bolivia. It is also the principal port for all the river traffic for a distance of 2,250 miles, extending the whole length of the rivers La Plata, Uruguay, Paraná and tributaries, connecting it with Montevideo, capital of the eastern republic of Uruguay, and with Asuncion, capital of Paraguay. Its climate is one of the most changeable in the world, though its annual average temperature corresponds to those of Genoa, San Francisco, Tokio and Sydney.

General Topography.— The city is spread out upon a plain on the right bank of the Rio de la Plata, 125 miles west of the city of Montevideo, which lies on the north bank of the estuary. Buenos Aires extends 11¼ miles from north to south and 15½ miles from east to west, with a circumference of more than 38 miles.

The plan of the city is quadrangular, similar to a chess-board. In the central part the streets are 32 feet wide and the blocks are 429 feet in length. By municipal regulations the height of the front of the buildings cannot exceed one and one-third times the width of the street. In 1892 the Avenida de Mayo was completed and opened. This avenue is 100 feet wide and a mile and a half long, and divides from east to west the oldest and most densely populated part of the city. It is well paved with asphalt and has in the centre, facing each block, three safety islands, with double electric light posts, and a row of plane trees extending the entire length. The buildings along this avenue vary in materials and in the number of stories. At the extreme eastern end it opens upon the Plaza de Mayo with an area of more than four acres, beautified with trees and flanked with public buildings;— the «Casa Rosada» («Pink House») or executive palace, the old House of Congress, the commercial exchange, the cathedrál, the municipal buildings, the «Bank of the Nation» and other establishments of importance. At the extreme western end is the new House of Congress of monumental proportions, which cost $6,000,000.

The district of the Boca (about 100,000 inhabitants) in the city of Buenos Aires, upon the left bank of the Riachuelo, and the district of Avellaneda (12,000 inhabitants) in front of Barracas to the south, upon the right bank in the jurisdiction of the province of Buenos Aires, are united by a draw-bridge and other similar devices, and the people living there are for the most part occupied in the traffic of the harbor, there being in all a business capital of $150,000,000 invested in this traffic. Moreover, the railroads to the west and to the south, which assist in this traffic, represent a capital of $201,500,000.

Harbors, Wharves, Markets, etc.— The location of the city, owing to the shallowness of the river, demanded the construction of an extensive harbor. Its facilities are as follows:—

inner harbor, comprising the north and south basins and docks and the Boca del Riachuelo; outer harbor, comprising the outer roads and channels through which shipping enters; the south channel, 11 miles long, having a depth of 17 to 22 feet; and the north channel, with a depth of from 20 to 23 feet. Both channels are 350 feet wide at entrance and marked by buoys.

This harbor was built in 11 years (from 1886 to 1897) and cost $35,000,000 gold. It covers a superficial area of 165 acres and consists of two canals (about 21 feet deep), one from the entrance and the other from the outlet (both provided with luminous buoys), which nevertheless do not satisfy the demands of traffic; two shipyards, four docks and two dry docks; 24 warehouses with a capacity, roughly estimated, of 20,000,000 cubic feet, which can hold 24,000,000 tons of merchandise, and which extend for 1½ miles fronting the wharves, the latter having a length of 6 miles (the same length as the harbor of Antwerp). It has grain elevators whose capacity amounts to 200,000 tons. Within the circumference of the harbor are 3½ miles of railroad. The wharf for animals on foot has room for 40,000 sheep and more than 1,500 beeves.

The Boca del Riachuelo has a depth of 18 feet and is bordered by wharves for three miles, and has a movement of 1,200,000 tons of merchandise per annum.

Facing these wharves on the right bank is the "Central Fruit Market," the largest warehouse in the world; it occupies an area equal to nine square blocks in New York. The cost of its construction was $4,155,000. It is the principal exchange for all business pertaining to the exportation of the fruits of the country, and in it are stored large quantities of the products of cattle industries.

The Southern Railroad has its own dock, on the right bank of the Boca del Riachuelo, 23 feet deep, with 1½ miles of wharves, for the exportation of agricultural and cattle products from the southern part of the province of Buenos Aires.

Commerce.— Compared with the principal harbors of the world, the harbor of Buenos Aires stands in the 11th place, and is second after New York in foreign commerce in all America. At the time of its greatest activity, the port harbors as many as 1,400 steamships and sailing vessels moving in and out. The general movement of passengers is about 150,000 outgoing and 250,000 arriving, annually, making an increase from immigration of 100,000 persons every year. The harbor of Buenos Aires receives 84 per cent of the importations for the entire country, and sends away 51 per cent of the national exports. About $17,000,000 have recently been spent in enlarging and widening this harbor to enable it to meet the expected development of commerce of the city and of the industries of the country.

Parks.— Buenos Aires has 79 parks and squares, with an area of 2,320 acres, one of the finest park systems in the world; the Zoo is one of the largest and the best kept on the whole continent; the Botanical Garden is only second to Rio de Janeiro's; squares, with profusion of flowers and handsome trees, are beautified with monuments to heroes of the struggle for independence.

Schools, Libraries, etc.— As in many other cities, the school buildings do not have the needed space for games and outdoor activities such as school gardening, etc. Already it is thought that the school buildings to be erected in the future should be located in the centre of the parks and public gardens, as in Japan. The school buildings in Buenos Aires, with highly ornamented façades, are quite unfitted for their purpose, not having the proper accommodations in the interior; Italian architects imported the scheme of treating the façade as a mere screen, disregarding modern hygienic exigencies for educational buildings. There are now about 250 public schools in which 200,000 scholars are enrolled. There are over 3,000 teachers (mostly women) in the elementary grades. The number of pupils from 6 to 14 years of age is over 200,000, there now being only 15 per cent illiterate against 20 per cent in 1895. In the secondary institutions of instruction (except the normal) about 3,000 pupils are enrolled. The number attending the seven normal schools of the city is 3,000, and a business college counts about 700 pupils. The university has 4,600 to 4,700 students. The public libraries possess 50,000 books.

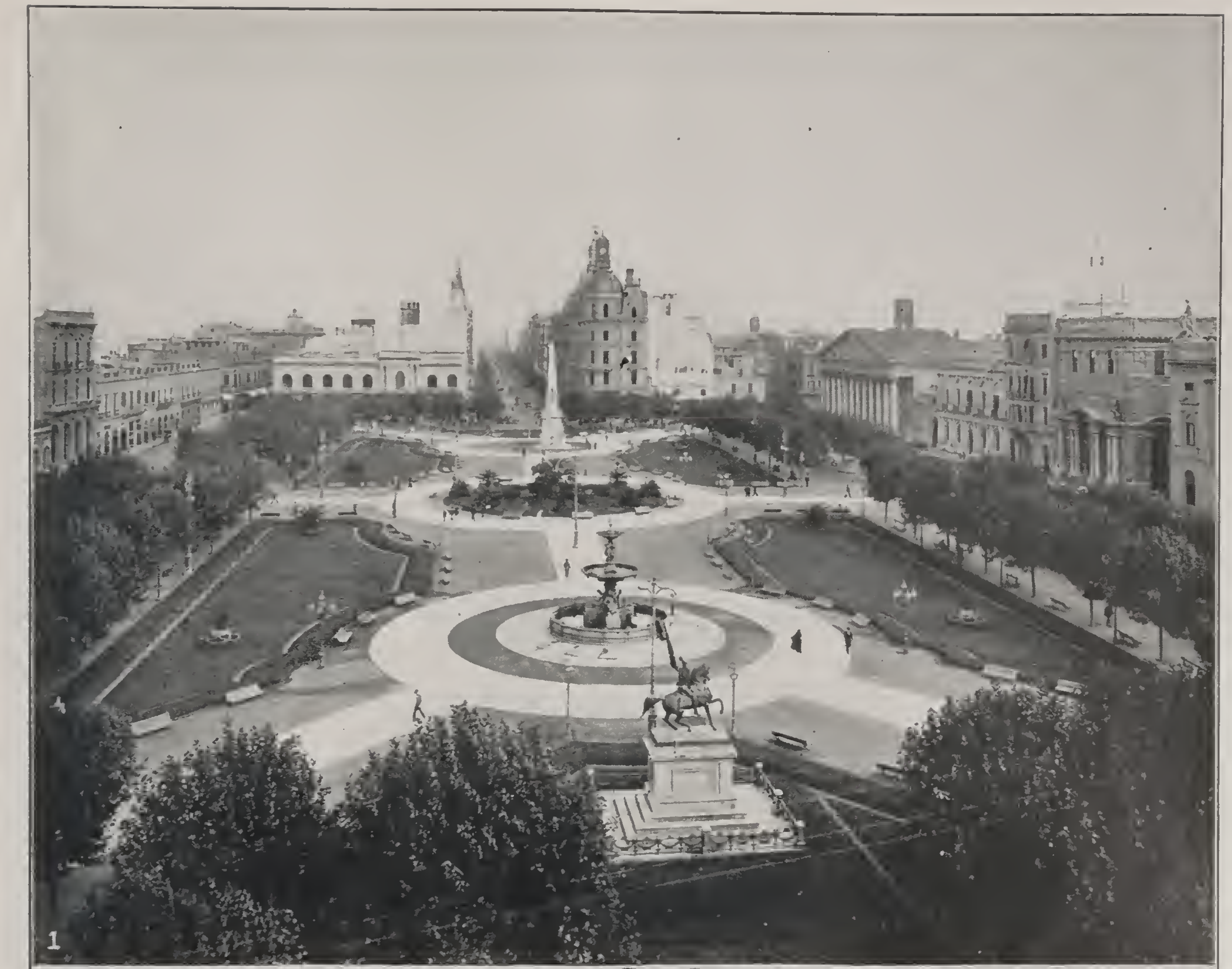
Press.— More than 200 newspapers are published in the city of Buenos Aires,— most of them in Spanish: but some are in Italian, English, French, Scandinavian, Russian, Hebrew and Arabic. *La Nación* and *La Prensa* have a daily circulation of over 100,000 copies and have the most extensive telegraph services in the world. *La Prensa* is a kind of institutional newspaper. Its building, one of the handsomest in the city, is dedicated to social services, and contains a library, free evening schools for commerce and for music, offices for free medical assistance, free legal aid, free chemical laboratory, etc.

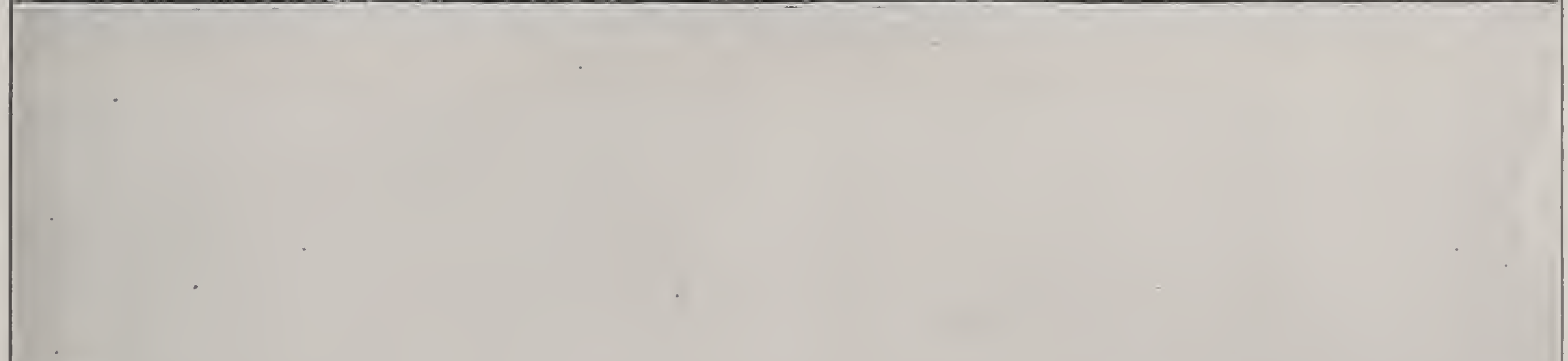
Sanitation.— The sanitary system (running water and sewers) is excellent and has cost the city $46,875,180. When in 1875 these works were proposed, there had been few years that the city had not suffered through terrible epidemics, cholera morbus in 1865 and 1873, and yellow fever in 1871. Since 1885, thanks to the extension of these works of sanitation, to the efforts of the Board of Health in the inspection of foods, and the struggle against tuberculosis and other contagious diseases, the mortality has been reduced from 44 per 1,000 in 1875 to 22.7 in 1894 and to 15.2 in 1908. There has likewise been a considerable reduction in the death rate of infants under one year of age, which in 1889 was 195 for each 1,000 born, and dropped to 141 in 1894, to 102 in 1899 and to 83 in 1904. In the same year the proportion in Christiania was 100, 111 in Paris, 146 in London, 162 in New York, 166 in Hamburg and 202 in Berlin.

The sewage of the city is handled by the circulating or dynamic sewage system. Drainage works costing over $35,000,000 discharge into the estuary of La Plata near Quilmes, 15.5 miles southest of Buenos Aires.

Another question which occupies the Argentine hygienists is to find a type of sanitary dwelling which will correspond to the change of customs and to the increase of population.

BUENOS AIRES, ARGENTINA





1 Plaza de Mayo (May Square), Showing City Hall and Catholic Cathedral
2 Plaza de Mayo (May Square), Showing Government House

Buenos Aires is the only city in the world with buildings suited to a mild climate which suddenly had to face modern conditions occasioned by a congested population and the rapid distribution of a heavy traffic, resulting from its being an important seaport. As they are now, the city blocks are not adapted to meet these demands. They have an area of more than four acres and there is no provision for an empty space in the centre. Therefore, the city lots are too long, the houses receiving light and air from a court or *patio,* which in the case of a many-story building does not provide for either. Besides, long houses do not afford privacy or comfort and are heated with difficulty — a serious detriment in a city where the temperature falls sometimes as low as 28° F., together with great moisture in the air.

Public Utilities.— The principal streets are electrically lighted, are well paved with asphalt blocks of wood and granite, and are kept in good repair, cleaned and sprinkled. The internal business of the city is very considerable. In 1904 there were 315 miles of street car lines, of which 166 miles were electric and 149 miles were horse-car lines; the latter power is gradually being exchanged for electric traction. During the year 1905 there were constructed 111½ kilometres of electric roads. The street railroads carry about 180,000,000 passengers, there being a vast increase in the last 10 years. There are also about 20,000 carts, 5,000 carriages, of which 2,500 are for hire, and 500 automobiles, which are in large demand. The five railroad stations handle about 15,000,000 passengers and 4,000,000 tons of merchandise; the post-office 85,000,000 letters and 76,500,000 packages and pamphlets.

Water required for general purposes is drawn from the estuary five miles above the city. The waterworks consist of two tunnels, subfluvial and subterranean, 18,702 feet in length, with two pumps capable of raising 6,073,320 cubic feet of water to a height of 49.2 feet every 24 hours. The filtered water is carried to a central reservoir at the highest point in the city. This distributing reservoir is provided with forcing pumps having three distinct flows: there are 12 tanks, elevated in groups one above another at 39.3, 55.7 and 72.1 feet respectively. It is the most noticeable iron construction in the city; 16,000 tons of iron were used in building it. The exterior is of pressed brick and vitrified tiles. The annual consumption of water is 11,000,000 gallons or a daily average of 33.5 gallons per capita.

The telephone service is very deficient. It has only 7,000 subscribers and connections with the cities of La Plata (38 miles), Rosario (186 miles), and by cable with Montevideo (125 miles).

Industries.— Buenos Aires is not especially industrial. There are not more than 119,000 workmen in its factories and workshops, where they work hides, wood, metals, clay for bricks, chemical products, constructive materials, manufactures pertaining to lights, furniture, carpets and hangings, cloths, preserved foods, etc.; and this production is stimulated by the protection of the custom-house, in spite of which Buenos Aires is well supplied with articles made in Europe and America. According to the last industrial census taken in the city of Buenos Aires, there were 10,350 industrial establishments.

Banking, Finance, etc.— Buenos Aires supports 21 banks of discount with a joint capital of $100,000,000. As late as 10 years ago, 10 were foreign and represented all the principal cities except New York, notwithstanding that in 1905 the business transacted with the United States amounted to $44,637,901, having increased 110 per cent in the previous five years; all of this business had to be done through London banks. In a year the Bolsa de Comercio (Chamber of Commerce) transacted business to the amount of $174,061,251, and the Clearing House passed through $2,875,924,788.35. The municipal taxes amounted to $7,500,000, 41 per cent of which is devoted to loans for new undertakings, 29 per cent for direct taxes and 11½ per cent for indirect taxes. In 1917 the National City Bank of New York was established in this field, with branches at Buenos Aires and Montevideo. Landed property sells yearly to the average value of $35,000,000, varying from $20,000,000 to $40,000,000 a year. The value of buildings constructed annually amounts to $15,000,000. There are annual transfers of real estate amounting to $42,240,000. The average of fire losses and insurance paid has not been high. See ARGENTINA — BANKING, ETC.

Population, Social Conditions, etc.— The census of 1869 gave the population of Buenos Aires as 187,346 inhabitants, and prophesied 600,000 for 1919; in 1895 it had 663,854 and in January 1917 about 1,700,000. The increase has been at the rate of 40 per cent in a decade (inferior alone to Chicago). Buenos Aires has more than 440,000 foreign residents, of whom 230,000 are Italians, 105,000 Spanish, 28,000 French, 6,000 English and 6,000 German. The greater part of the landowners of the province of Buenos Aires and the Pampas prefer to live in the city of Buenos Aires, enjoying the rent of their land or hoping that the improvements on their neighbors' lands will increase the value of their own. In this respect, that province and this territory are to the city of Buenos Aires what Ireland has been to London. Because of this and because the city is the seat of the national government, also because of the many commercial establishments engaged in foreign trade, Buenos Aires is a centre, where the light and splendor of a great capital never die out. It has two theatres where in an especially interesting season appeared Saint-Saëns, Puccini, Sara Bernhardt, Coquelin, Rejane, Tina di Lorenzo, Jane Hading, Novelli, Caruso, etc. Nevertheless, this wealth, which is the result of the absenteeism above referred to, retards the progress of the country districts and gives birth to a close, feudal plutocracy. Such a social condition is not best fitted to call forth a truly democratic public spirit. However, the spirit of association commences to enjoy a broader outlook, there being a constant increase in the number of educational and civic associations whose object is to make all classes participate in social well-being. The charitable institutions are disposed more and more to abandon their cut-and-dried methods, and instead of lessening the effects of poverty, they endeavor to prevent its causes through a collective social crusade, hoping that before long a law against child-labor will be passed and that model reformatories and juvenile courts will be established to better the general conditions of children.

There are over 5,000 persons in the asylums. The free municipal lodging-house gives lodging and board to 41,578 persons, the Salvation Army to 40,305, the French Charity Association to 5,046. The criminals arrested annually for each 1,000 inhabitants from 15 to 70 years of age may be divided very nearly as follows: German, 4.23; Argentine, 8.70; Spanish, 8.26; French, 3.40; English, 4.93; Italians, 6.61; Uraguayan, 8.65.

In one year there were 929 births for each 10,000 foreign women. That year, for each 10,000 Argentine women were born 1,926 children. Later, these figures decreased to 850 and 1,300 respectively. There are about 75 marriages and 150 deaths for each 10,000 inhabitants. For history, see ARGENTINA.

Government.— The communal government of the city is a kind of government by commission, composed of an intendente and a deliberating council appointed by the national executive authority. The amount of annual expenditures is about $10,000,000.

As is evident, it can hardly be said that Buenos Aires enjoys self-government, strictly speaking. Nevertheless the government possesses considerable prestige, resembling in this respect an aristocratic city. For this reason the public employees seek for the reward of public opinion, and it has been said that there is not a city in the world where so much is accomplished for the same amount of money. On the other hand, as a consequence of paternal government, apathy is to be found in furthering official action. The *Asistencia Publica,* or board of health, can truly be called the best in the world. The 18 hospitals are well kept, many in very appropriate buildings. The sale of food in the 35 markets of the city is scrupulously controlled.

In the *Americas,* October 1916, recent railway developments in and about Buenos Aires are described, the writer calling attention to the circumstances that suburban Buenos Aires is served by three railways — The Central Argentine and the Southern, each of which operates two lines, and the Western which operates one. One of these roads has finished the electrification of its route; another has completed a subway under the city. Measures of the volume of business at Buenos Aires in 1916 are supplied in a cablegram which gives "the barometrics of the business situation at the beginning of September," as follows: Visible gold supply in Caja de Conversion (see ARGENTINA — BANKING AND FINANCE) and legations $317,000,000; in banks $27,000,000, circulating currency, paper $1,013,000,000, bank clearings, August, $613,000,000 paper; business failures, August, liabilities $9,000,000 and assets $10.-000,000; foreign vessels entered, August, 126 with net tonnage 208,000; exportation of wheat, August, 82,000 tons, of maize 329,000, of linseed 53,000, of oats 127,000 tons, etc.

JUAN A. SEÑILLOSA,
Former Argentine Consul-General to Canada.

BUENOS AIRES, University of (Universidad Nacional de Buenos Aires), the national university of Argentina and the largest institution of learning in South America. It was founded in 1821 by the consolidation of several small institutions. It was charged with the administration of all official instruction — elementary, secondary and collegiate. Its students number about 4,650, and its courses cover agriculture, engineering, law and government, mathematics, medicine, natural science, letters, science and philosophy. Its library contains about 97,000 volumes.

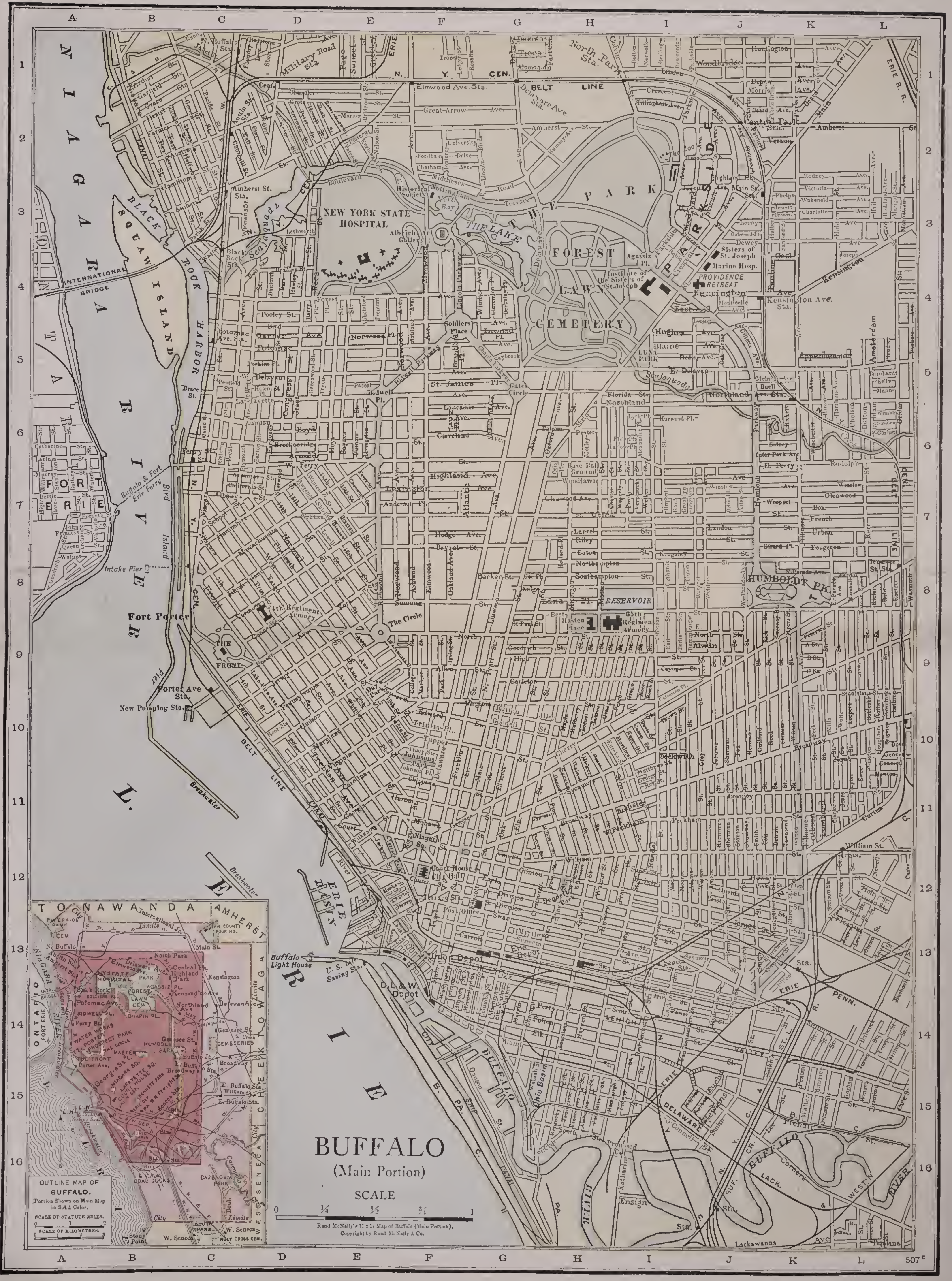
BUFF, a mixed color, something between pale pink and pale yellow. It was adopted by the English Whig party, in combination with blue, as their distinctive color; and, possibly in consequence of that circumstance, the Whig party having been opposed throughout to all the measures of government which led to the American Revolution, was chosen as the national uniform of the Americans at the opening of the Revolutionary War.

BUFF LEATHER, a leather prepared by saturating the hides with some aluminous substance, and afterward with oil. Leather prepared in this way is softer and more flexible than any other kind, and on that account it is much used for soldiers' cross-belts, gloves and other military accoutrements. Its color is naturally light yellow, but it is in some cases bleached before being used. The buff leather used in former times to make the jerkins, worn under coats of mail to deaden the pressure of the metal on the body, and to prevent any contusion from a blow, was made from the hide of the urus, or wild bull of central Europe, the common name of which was buffe, whence the name of the leather was derived.

BUFFALMACCO, boo-fal-mäk'kō (assumed name of BUONAMICO CHRISTOFANI), Italian painter who flourished according to Vasari during the first half of the 14th century. The same authority attributes to him the frescoes depicting the Passion in the hall of the Campo Santo in Pisa (uncovered in 1910), and states that he worked in Arezzo, Florence, Bologna and Cortona. He is mentioned by Boccaccio in the ‹Decameron› and by Sacchetti in the ‹Novelle.› Consult Bacci in ‹Bolletino d'Arte› (Rome 1911).

BUFFALO, N. Y., county-seat of Erie county, the 2d largest city in the State and 11th in the United States; situated at the eastern end of Lake Erie and on its outlet, the Niagara River. Its centre is 24 miles south of Niagara Falls, and its important suburbs, the Tonawandas, are half way between. It lies due west 297 miles by rail from Albany and 499 from Boston; northwest 425 miles from New York, and 417 from Philadelphia; about 410 southwest from Montreal, and 540 east of Chicago. It extends about 10 miles along the lake and river front, and half as far east; area, 42 square miles.

Description.— Buffalo, which began at the mouth of Buffalo Creek, has spread mainly north and east up to a gradual rise, a plateau some 80 feet above the lake and 620 above sea-level. It is laid out in wide, rectangular streets, beautifully shaded and decorated with shrubbery more completely than any other city in the world. No less than 260 miles of its 600 miles of streets are asphalted, 84 are stone-paved, 37 are brick-paved and 16 are macadamized. The chief business streets are



BUFFALO

(Main Portion)

SCALE

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Rand McNally's 11 x 14 Map of Buffalo (Main Portion).

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Main, running north and northeast from the harbor to the city limits; Delaware avenue, parallel with it; Niagara, north and northwest along the river front to Tonawanda; and Broadway, which with Genesee, Sycamore and Seneca, widen spoke-like from the heart of the business district around Lafayette and Niagara squares. Each of these is several miles long. The finest residence streets are Delaware avenue and North street. The latter crosses the former at right angles a mile north of the centre; they are set with large separate mansions, having great lawns, gardens and shrubberies, a fashion followed in the new residence streets to the north.

Municipal Service and Improvements.— The street cleaning and sprinkling services, under municipal control, cost $475,573 in 1915. The sanitary service, embracing ash and garbage removal, also done by the city, in the same period cost $310,589. Both these departments are notably efficient. The sewage, collected through 544 miles of mains, is emptied into the Niagara River and carried swiftly away. The first public bath house erected in New York State under the law of 1895 was opened here in 1897. All these things, with the cool and healthful summer climate which attracts many visitors, enable Buffalo to claim the distinction of being the cleanest and healthiest city in the United States. The death rate in 1915 was 13.98, inclusive of residents and visitors. Exclusive of non-residents, it was 13.83. The waterworks built in 1888 in 1915 were augmented by the opening of a large pumping station, erected at a cost of nearly $7,000,000. They are supplied by water from Emerald channel, the purest source in Lake Erie. The water is conveyed from the intake to the shore station by means of an immense underground tunnel, blasted through solid rock. The reservoirs have a storage capacity of 200,000,000 gallons a day. The average consumption is about 150,000,000 gallons a day, or 312 gallons per capita per day. Nearly 600 miles of mains distribute the water, and the cost of the water department in 1915 was $1,182,212, including interest on $11,620,383 outstanding water bonds. Electric lighting is almost universal in business houses and residences, the cheap power furnished by Niagara Falls being used. The police department number 907 men. There are 14 precincts, a substation and a headquarters building. A harbor patrol is maintained and the cost of operating the department in 1915 was $1,079,245. The fire department is thoroughly modern, its equipment consisting largely of motor-driven apparatus of the latest type. There are two chiefs, 12 battalion chiefs, three fire boats, an up-to-date system of storage and signal boxes, 678 men and the annual cost of operation and maintenance is $1,105,385. An important municipal improvement has been the transfer of telegraph, telephone, police and fire alarm wires from overhead poles to conduits. The street railway system was the first in the United States to be equipped for electric power. It covers 250 miles of double tracks, 96 miles of single tracks and 31 miles of extra tracks within the city limits. The lines extend to all suburbs, along the Niagara River to Niagara Falls and across into Canada.

Parks and Cemeteries.— The park system includes six large parks of 1,229 acres, connected by a magnificent system of boulevards, speedways and approaches, covering 28.45 miles, and 367 acres of minor plots and squares. Much the largest is Delaware Park, on the north side, with an area of 362 acres and a lake of 46½ acres; here and on adjacent grounds the Pan-American Exposition of 1901 was held. It is continued on the south by Forest Lawn Cemetery, comprising 239 acres — by far the greatest of the 26 cemeteries in the city — and contains monuments to former President Millard Fillmore and the Indian chief, Red Jacket. On the west of the park begin the grounds of the Buffalo State Hospital for the Insane, occupying 203 acres. Toward the southeast is Humboldt Park, 56 acres; and overlooking the lake at the point where the river starts is the Front, a bold bluff 60 feet high. This is the site of Fort Porter, garrisoned by United States soldiers. The parade ground consists of 48 acres, and is a favorite promenade because of the fine view it affords. On the south side of the city are South Park, 155 acres, and Cazenovia Park, 106 acres. Another large park is Riverside, 37 acres, on the north side of the city. There are attractive squares in different parts of the city, including Lafayette, Niagara and Gates. Lafayette contains the Soldiers and Sailors' monument, erected at a cost of $50,000. A beautiful marble shaft, in honor of the memory of former President William McKinley, who died in Buffalo, stands at Niagara square.

Principal Buildings.— There are numerous large and fine buildings in the city. Among these are the Marine National Bank building, the Iroquois Gas building, the Electric building, the Ellicott Square, the New York Telephone building and the Manufacturers and Traders' National Bank building. The city also owns two large halls, Elmwood Music Hall and the Broadway Auditorium. Other noteworthy structures are the Albright Art Gallery, a gift to the city from John J. Albright, and ranking as one of the leading art centres in the country; the home of the Buffalo Historical Society, which was the $200,000 New York State building at the Pan-American Exposition; the Federal building, erected at a cost of $2,000,000, the City and County Hall, the Chamber of Commerce building, the 65th and 74th regimental armories, the Central Y. M. C. A. building, the Buffalo State Normal school and five of the most complete and expensive high schools in the United States.

Trade and Commerce.— Buffalo's position at the eastern terminus of the Great Lakes and the distributing point for the East has made it one of the large cities on the lakes. It ranks as one of the world ports in the volume and variety of products received and transshipped, although the harbor is ice-bound one-third of the year. In 1915 the tonnage of the port was upward of 19,000,000 tons, and the customs receipts were $1,170,195. Naturally, its foremost handlings are of western products, such as grains, flour and provisions, as well as live stock. Its receipts of grain, though varying with the crop, in 1915 was 258,404,000 bushels, while the flour receipts were 8,429,000 barrels. Next in importance is the live stock industry. Buffalo handles more horses and sheep than any other American port, and is among the first in cattle and hogs. It receives more than 15,000,000 pounds of fish yearly, largely from the Georgian Bay district, and sends it to inland points east and west. The lumber industry is another of the leading ones in the city, its receipts of this product in 1915 being 85,884,000 feet, and it receives immense quantities of pig iron and ore, the same in 1915 reaching 5,358,000 tons. The total export trade is over $80,000,000 a year. This immense development, in a measure, has been made possible by co-operation between the Federal, State and municipal governments in providing facilities for handling the business — breakwaters, piers, basins, canals, etc.— and as yet Buffalo has not commenced to utilize to any degree of capacity the numerous facilities available. Originally, as with most lake ports, the harborage was only the shallow mouth of a small river, Buffalo Creek, but which now is navigable nearly three miles inward. The United States has built a great series of stone and cement breakwaters, four miles long, at a cost of upwards of $2,000,000, which forms an inner and an outer harbor, one of the best on the Great Lakes. The State has built Erie and Ohio basins, which will be used for terminals of the new and enlarged barge canal. The city has deepened the Buffalo River giving a ship canal more than two miles long and navigable to a depth of 23 feet. The banks of the river are lined with industries, and there still is much land vacant for development. Nearly a score of steamboat lines run from Buffalo to different lake points, including the excursion routes to nearby resorts and more distant places. The Welland Canal, about 20 miles west of Buffalo, connects Lake Erie with the Saint Lawrence River. Improvements now under way will, when completed, make it possible for the largest lake steamers to go from the lake to the river. Niagara River to beyond the Tonawanda is navigable for the largest boats on the Great Lakes, the Federal government having built a ship canal, immense locks and dredged a 23-foot channel. New York State's barge canal system, built at a cost of $130,000.000 and involving an enlargement of the principal canals of the State, makes a continuous waterway from Buffalo through the heart of the State to the Hudson River. As to railroads, Buffalo is the terminal of the main line or some spur of every trunk road from Philadelphia to Quebec; from the east in the United States, the New York Central, Erie, Lehigh Valley, Delaware, Lackawanna & Western, Pennsylvania, Buffalo, Rochester & Pittsburgh; from the west, the Lake Shore & Michigan Southern, Michigan Central, New York, Chicago & Saint Louis, Wabash; from Canada, Canadian Pacific, Grand Trunk and Canada Southern. Electric lines entering the city are the Buffalo and Lake Erie Traction Company from the west, and the Buffalo, Lockport & Rochester Electric Railway from the east. There are 250 passenger trains a day, 700 miles of railroad tracks within the city limits, and six square miles of territory are owned by railroads. There are ferry lines connecting the United States and Canada at Fort Erie, and the International Bridge connects Buffalo and Bridgeburg, Ontario. The internal conveniences for carrying on a great trade correspond to the railroad and steamship facilities. Two great passenger terminals were practically completed in 1916, and there are 22 immense grain elevators, with a storage capacity of 28,250,000 bushels. Some of these are among the largest in the world. The chief one, the Frontier, has a capacity of 4,000,000 bushels. The first elevator in the world was built here in 1843. The largest coal pocket in the world, that of the D., L. & W. Railroad, is located here. It is 5,000 feet long, and ships a large part of the 3,864,000 tons of coal annually exported. Upwards of 10,000,000 tons are received in the city yearly by rail. The coal docks can handle 29,000 tons each day. The railroad coal stocking trestles are in the eastern part of the city, as are the great stockyards, nearly 100 acres in extent.

Manufactures.— Buffalo has a more diversified line of industries than any city in the country, according to the United States census reports. Two advantages are natural gas, for which mains have been extensively laid, and cheap electric power from Niagara Falls. In 1915, 70,000 persons were employed in the manufacturing establishments of the city. The principal industries are — with figures according to the 1910 census (except food, mason, carpenter, tinsmithing, jobbing, etc.) — wholesale slaughtering and meat packing, $25,416,000; foundry and machine shop products, $20,775,000; flour manufactured, 5,358,000 barrels; the Lackawanna Steel Company, capitalized at $70,000,000, has the largest and most capacious independent steel plant in the world, with a private breakwater a mile long and a spacious harbor; linseed oil, $6,500,000, partly used in the manufacture of $800,000 worth of paints; malt and malt liquors, $6,500,000; railroad cars, $5,000,000; soap and candles, $8,652,000; flour and grist mill products, $19,941,000; planing mill products, $3,500,000; factory-made clothing, $4,712,000; chemicals, $2,000,000, largely increased after the start of the European War; patent medicines and compounds $2,801,000; leather and leather goods, $3,938,000; factory-made furniture, $4,184,000; besides more than $1,000,000 each of carriages, automobiles, confectionery and large quantities of jewelry and tobacco products. There are, in all, more than 200 varieties of industries. In 1910 the value of Buffalo's products was $218,803,994. The United States census of manufactures for 1914 recorded for Buffalo 2,225 industrial establishments of factory grade, employing 67,534 persons, of whom 54,424 were wage earners, receiving annually $34,820,000 in wages. The capital invested aggregated $243,311,000, and the year's output was valued at $251,103,000: of this, $92,257,000 was added by manufacture.

Finances and Banking.— The assessed valuation of the city has increased in 25 years from $38,000,000 to $346,560,000 in 1915, nearly all in real estate, with a tax-rate of $26.10. The total outstanding bonds amount to $37,870,446.82, including $11,620,383 of water bonds. Upon the aggregate there is an annual interest charge of $964,833.65. The sinking funds amount to $4,230,276.21, and the city's resources are valued at $59,312,228. The city budget for 1915 was $12,174,902, minus resources of $3,131,812, leaving $9,043,090 to be raised by taxation. The post office receipts are more than

$2,000,000 annually, and the internal revenue receipts in the same period more than $3,000,000. There are 10 banks of discount (including four national banks) with a capital and surplus of $15,169,181 and total deposits of $150,259,000; four trust companies, with $3,506,000 capital and surplus, and four savings banks with more than $118,000,000 deposits and $10,000,000 surplus.

Churches.— Buffalo is the seat of Roman Catholic, Episcopal and Methodist bishops, and has two large and impressive cathedrals. The newer structure, built out of white marble at a cost of more than $800,000, is a stately edifice with a set of 42 chimes said to be the best in the country. Besides there are 60 Catholic churches, 12 convents and 199 Protestant churches, the most numerous being 31 Baptist, 17 Presbyterian, 24 Methodist, 24 Episcopal, 7 Churches of Christ, Disciples, 23 Evangelical Lutheran and 4 Congregational. There are also 9 synagogues and Jewish temples. The most notable Protestant churches are the First Presbyterian, Trinity Episcopal, Saint Paul's Episcopal and Holy Trinity Lutheran.

Charities.— There are 12 children's refuges in Buffalo and as many homes and refuges for adults; besides a Children's Aid Society and S. P. C. A., a Charity Organization Society, Associated Jewish charities, many religious organizations for relieving distress, a Church Federation, a central organization of the Protestant churches; 27 hospitals, besides the United States Marine Hospital, the Erie County Home, the Erie County Lodging-House, a District Nursing Association, Legal Aid Bureau, Association for the Prevention and Control of Tuberculosis, city dispensaries and clinics.

Of the children's institutions, the more notable is the free Fitch institute, a crêche or day nursery for children of poor working mothers — training school for nursemaids, etc., which is managed by the Charity Organization Society (organized in 1877, the first in the United States). Of the more important institutions, the following may be mentioned: Social Service buildings, headquarters for charitable and social service organizations, made possible by gift of the late Mayor J. N. Adam; Monsignor Nelson H. Baker's institutions at Lackawanna (Catholic) the Buffalo Orphan Asylum (nonsectarian), Saint John's Home for Orphans (Lutheran), the Home for the Friendless, Saint Vincent's and Saint Joseph's Roman Catholic orphanages, Saint Mary's Asylum for Widows and Foundlings and Saint Mary's Institute for Deaf-Mutes, the Lutheran Church Home and Ingleside Home.

Other notable buildings are the Homeopathic Hospital, the Children's Hospital, the Buffalo General Hospital, the Gratwick Cancer Laboratory and Hospital, the only institution in the world exclusively devoted to cancer research; the municipal J. N. Adam Memorial Hospital for Incipient Tuberculosis at Perrysburg, and a great Municipal General Hospital, to cost upward of $5,000,000 when completed, which now is in the process of construction.

Organizations.— There are many clubs, organizations and associations in the city, devoted to many and varied causes. In addition to the smaller and more numerous social and athletic organizations, there are the larger and more important Buffalo Club, Park Club, Ellicott Club, Country Club, Saturn Club and University Club. There are a Chamber of Commerce, a Better Buffalo Association, a Greater Buffalo Ad Club, and a Rotary Club. There are five branches of the Young Men's Christian Association, including two railroad branches in the city.

Education.— The city in 1917 had 73 public grammar schools, including four vocational and one teachers' training school, housed in about 126 buildings. In 1917 there were 2,187 day school teachers, 600 evening school teachers and 375 vacation school teachers. The registration of the day school was 67,093, for the evening schools 15,700 and for the vacation schools 11,000. As part of the school system there are five modern high schools, four of them completed within the past two years. One of these is the most complete technical high school in the United States. There are 45 Catholic parochial schools, with an estimated attendance of 30,635 5 Luthern parochial schools, 1 Jewish and 75 private schools and academies. There also are some 20 free kindergartens in connection with the public school system, orphan asylum schools and a school at the East Ferry Street Municipal Hospital.

Of the higher institutions of learning, the chief are the University of Buffalo and Canisius College, both with complete arts and science courses. The university is 70 years old, with six departments; 4,100 alumni, 209 instructors and professors and 943 enrolled students. It owns a large plot of land upon which it is planned to erect a complete and up-to-date building. Toward this a large sum has been pledged. Canisius College is a Catholic institution with a preparatory school, Canisius High School. Other schools are Saint Joseph's Collegiate Institute, the Academy of the Sacred Heart, Holy Angels' Academy, Miss Nardin's Academy, D'Youville College, the last two for women and all Catholic, the German Martin Luther Seminary and the Park and Nichols schools.

The Fine Arts Academy is located in the Albright Art Gallery, a splendid edifice of pure white marble, built in the style of a Grecian temple; the Buffalo Historical Society with interesting relics and a large library is in the old New York State Building; the Buffalo Society of Natural Sciences, with a valuable museum of natural history, with nearly 60,000 specimens is in the Buffalo Public Library Building. There are many other art and literary organizations, drama clubs, musical clubs and theatres, including the Buffalo Guild of Allied Arts. The city has a branch of the Drama League and there is an Artists' Club.

Libraries.— The two chief ones are the Buffalo Public and the Grosvenor. The former was installed in a large and modern structure in 1897, and now has 330,057 volumes and 23,902 pamphlets, a large and complete reference department and also newspapers, magazines and periodicals. The library conducts numerous branches and loans traveling libraries to schools and other institutions. Grosvenor Library (Reference) contains 100,000 books and 15,000 pamphlets; the State Law Library of the eighth judicial district contains 41,000 volumes; Buffalo Historical Society, 33,973 volumes, including the John C. Lord Library of

10,262 volumes and the Millard Fillmore Library of 612 volumes, and 5,000 pamphlets; Buffalo Catholic Institute Library, 18,000 volumes and 500 pamphlets; the medical library of the University of Buffalo, 6,000 volumes; the Central Y. M. C. A. Library, the Lutheran and German Y. M. A. Library, the Polish, Adam Mickiewicz, the North Buffalo Catholic Association and Saint Michael's Sodality libraries.

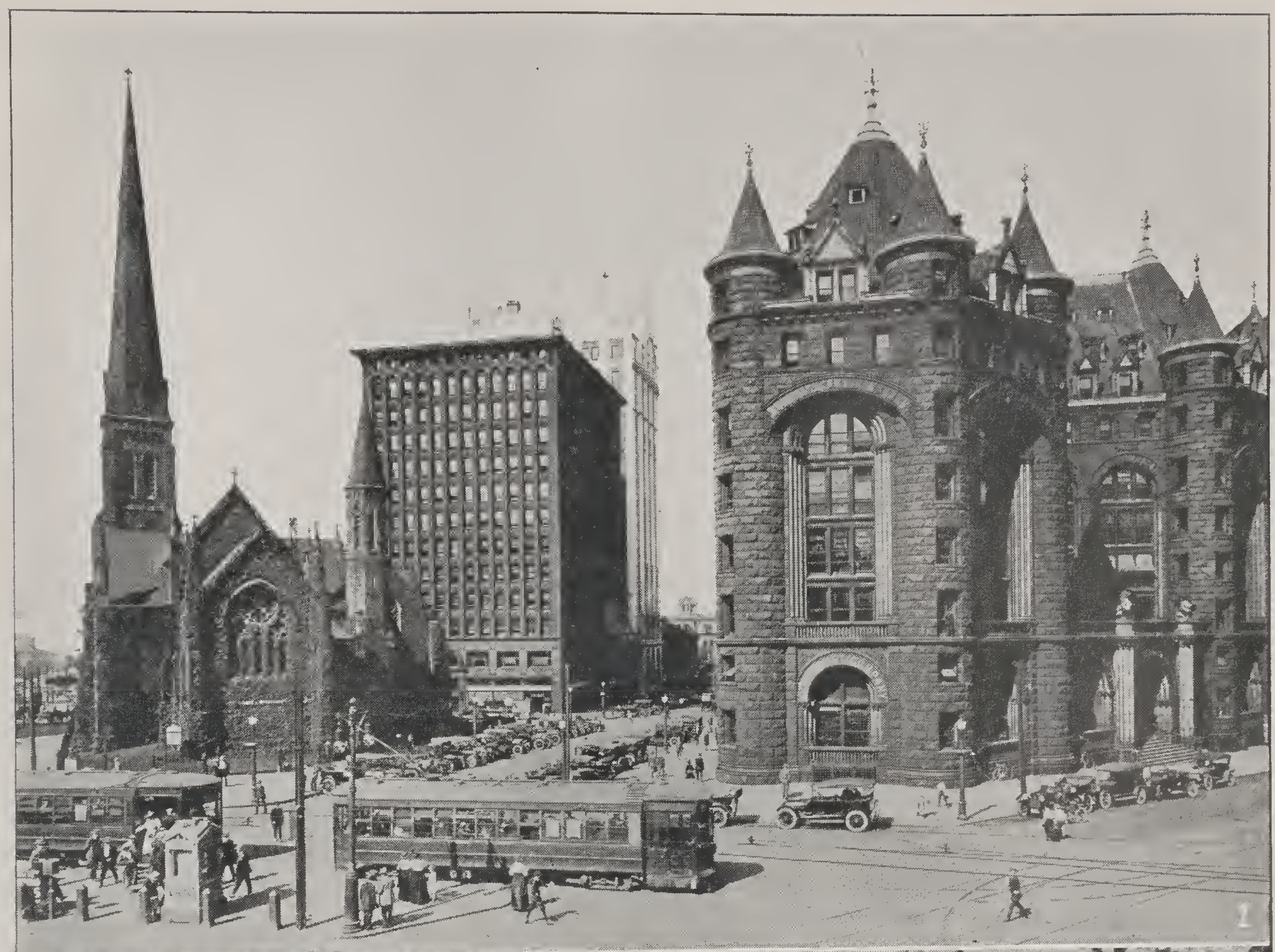
Publications.— In 1917 there were published in Buffalo 11 daily papers, including 2 German, 2 Polish and a live stock record; 5 Sunday papers, including 3 English, 1 German and 1 Polish; 21 weekly papers, 12 monthlies, and a score of smaller ones, having merely sectional distribution. There also are 3 quarterly and 2 fortnightly publications.

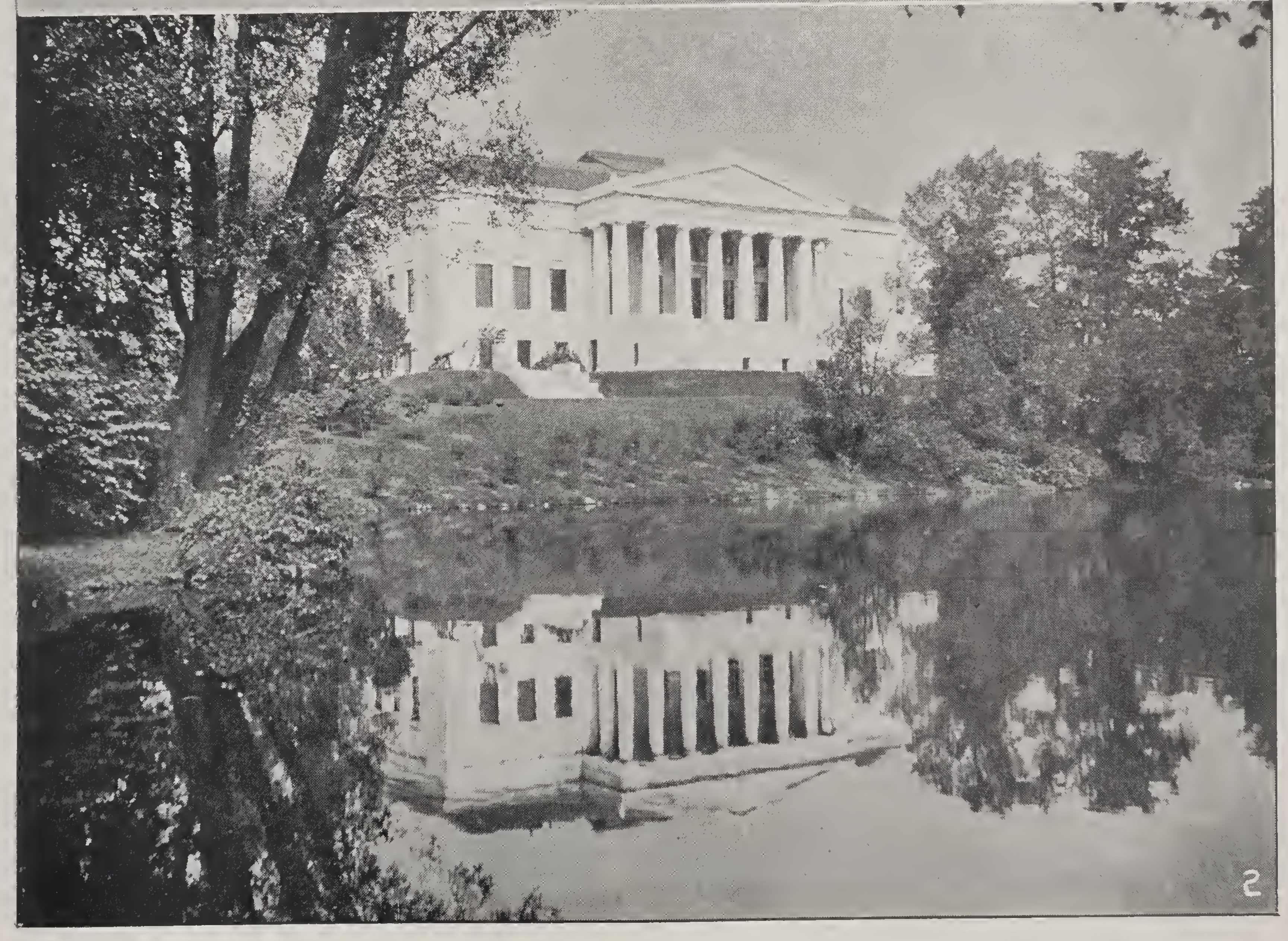
Government.— Since 1 Jan. 1916, the city of Buffalo has been under the commission form of government, being the largest city in the United States to be thus governed. The administration consists of a council of five, which has both administrative and legislative authority. The mayor is president of the council, and has under his immediate supervision the department of public safety, comprising the police, fire and health departments. One councilman or commissioner directs the school department, which includes the poor department, with the assistance of a board of education of five; another has charge of parks and public buildings; a third is superintendent of public works and the fourth superintendent of the department of finance and account. The charter has a referendum clause but does not provide for initiative or recall. Primaries for the nomination of commissioners are held entirely separate from the ordinary political primaries, the aim being to divorce politics from the municipal government completely. Until 31 Dec. 1915, the city was governed by a common council, consisting of an upper house of nine councilmen, elected at large, and a lower house of 27 aldermen, elected from as many wards. The mayor was the head of the city government, with various elected officials in charge of departments, such as the treasurer's office, the assessors' office, the comptroller's office, the public works department and the school department.

Population.— Buffalo has grown steadily, now ranking among the foremost American cities. Her name first appeared in the Federal census of 1820, with a population of 2,095, with increases as follows: 1830, 8,668; 1840, 18,213; 1850, 42,261; 1860, 81,129; 1870, 117,714; 1880, 155,134; 1890, 255,664; 1900, 352,387; 1910, 423,715. By 1920 its population had increased to 506,775. In addition there are numerous suburbs, within a dozen miles of the downtown section of the city, where workers in the city live. These include the Tonawandas, Tonawanda and North Tonawanda, both classed as cities; Kenmore, Williamsville, Lancaster, Depew, Hamburg and Orchard Park. The six last named are villages, and practically all of the trade is done in Buffalo. Lackawanna is another city outside the Buffalo city limits and adjoining it on the south but like the other places mentioned, due to rapid transit facilities, most of the trade is done in Buffalo. According to the United States census of 1910, Buffalo was the 10th largest city in the country. Ten years before Buffalo was 11th. Buffalo has a foreign population of considerable proportions, but this is being assimilated under intelligent and sympathetic supervision. The following figures from the 1910 census show the number of native-born and foreign-born residents: foreign born, total, 118,444; native born of foreign parentage, 183,673; and native born, 121,598. Of the foreign-born population, the principal nationalities represented are Polish, German, Italian, Irish and Polish-German Jews.

History.— The site of Buffalo was originally a basswood forest, amid which an Indian tribe, the Kahkwas, between the Neutrals and the Eries, hunted and fished along the creek; it was exterminated by the Iroquois before 1651, and not a single Indian lived there again for more than a century and a quarter. In 1679 La Salle passed the spot in his 60-ton sloop the *Griffin,* the first sailing vessel ever on Lake Erie, built at Cayuga Creek below. In 1687 the Baron La Hontan recommended it to the French government as the proper site for a fort to command the fur trade down the Niagara, and marked a «fort supposé» on his map; but no attention was paid to him. In 1764 Colonel Bradstreet built Fort Erie across the river on his Indian campaign. In 1780 the Senecas, driven from their old haunts by Sullivan's campaign, settled along the creek inland; the next winter an English family captive among them heard them call the creek by a name they translated «Buffalo,»— whether rightly or not is disputed but probably enough the herds had sought the salt-licks to the east. Their narrative was published in 1784, and in the treaty of Fort Stanwix that year between the English and the Iroquois, the name was used as familiar to the latter. The Indian settlement soon became known as «the village on the Buffalo,» currently shortened to «Buffalo village,» and presently to «Buffalo,» without any official sanction. The land had formed part of the grant of James I to the Plymouth Company in 1625, and that of Charles II to the Duke of York in 1664. The consequent dispute between Massachusetts and New York was compromised in 1786, and ultimately the Holland Company of aliens became patentees in trust in 1792, and by legislative permission owners in fee in 1798. Meantime a few settlers had straggled in; a trader named Cornelius Winne in 1789; two families in 1794 and 1796; and in 1797, when there were half a dozen houses, the first white child was born, a girl. A number of others took up residence there by 1803. In that year, by the advice of their surveyor, Joseph Ellicott, the founder of Buffalo, who had assisted his brother Andrew in laying out the city of Washington, and was convinced that here was the site of another great city, the company had him plot a village, and in 1804 sold the first lots. He called it New Amsterdam, and named the streets after the members of the company, but the settlers disregarded all his names and his oxbow line for Main street, where his own mansion was to be. In 1810 the town of Buffalo was incorporated, including several now separate townships. In 1811 the first newspaper, the Buffalo *Gazette,* was established. In 1813 Buffalo village was incorporated, and received a new charter in 1822. In the War of 1812, after the storming of Fort Niagara by the British in De-

BUFFALO, NEW YORK





1 (Left to right) St. Paul's Church; Prudential and Telephone Buildings, and Erie County Savings Bank Building
2 Historical Society Building, Delaware Park

cember, a force of British and Indians under General Riall was detailed to destroy Black Rock and Buffalo; on the 29th captured the latter, and the next day burned all but seven or eight houses, coming back 1 January and burning all but three of the rest. The settlers reoccupied their homes to some extent on the 6th, but it was not generally rebuilt till 1815; on 10 April 1814 General Scott put it under military rule. In 1818 the first steamer, *Walk-in-the-Water,* was launched. For many years, however, supremacy was balanced between it and Black Rock down the river, now the northern part of the city, where at that time was the ferry across the Niagara to the Canada side; but in 1825, after a fierce struggle, the former secured the terminal of the Erie Canal, and in five years its 2,412 inhabitants had grown to over 8,000, and its future was assured. Long after, however, able capitalists invested heavily in Dunkirk, 48 miles south, in faith that it and not Buffalo was the coming lake port. In 1832, it became a city, and the next year it annexed Black Rock. Buffalo has given two Presidents to the United States, Millard Fillmore and Grover Cleveland, the latter its mayor in 1882. From 1 May to 1 Nov. 1901, the Pan-American Exposition was held here, and on 6 September President McKinley was shot while attending it.

Consult publications of the Buffalo Historical Society; Smith, ‘History of the City of Buffalo and Erie County’ (1884); Ketchum, ‘History of Buffalo’ (1864–65); Powell, ‘Historic Towns of the Middle States’ (1899); Severance, ‘Picture Book of Earlier Buffalo’ (1913).

ARCHER A. LANDON,
President of Buffalo Chamber of Commerce.

BUFFALO, Wyo., town and county-seat of Johnson County, 30 miles southeast of Sheridan. It has a Carnegie library, courthouse, county high school and the State Soldiers and Sailors' Home. Agriculture and stock-raising are the chief industries. The waterworks and sewage system are the property of the municipality. Pop. 1,368.

BUFFALO, a name frequently misapplied to the American bison, but more properly designating a type of heavy oxen, of the tropics of the Old World, long domesticated in the Orient. Buffalo are characterized by their long, angulated horns, broad and flat at the base, so as to form in some cases a shield over the forehead; and by their broad, splay feet, particularly adapted to wading in muddy waters, where they mainly feed on aquatic grasses and other plants. There are three distinct species.

The largest and fiercest buffalo is the black «cape,» or South African species (*Bos caffer*) found throughout the entire south of Africa, northward to Abyssinia. It reaches a length of six feet, and in old bulls the relatively short horns join at their bases, so as to form a helmet-like mass, which makes the head almost invulnerable. The horns curve «outward, downward, and backward, and then forward, upward, and inward.» This buffalo is bluish-black, and nearly hairless. Its chief enemies are the lion and man, whose combined efforts have greatly decreased its numbers. The buffalo are warned of the approach of danger by the buffalo-birds (q.v.), which constantly hover near them. Another species (*B. pumilus*) is widely scattered throughout the west and central parts of Africa. It is smaller than the more southern species, and is chestnut in color. The most widely domesticated of the buffalo is that of India (*B. bubalus*), called «arni» (feminine «arna») by the Hindu. It differs greatly in appearance from the African species, having a cow-shaped head, and long, much flattened, triangular horns, covered with transverse wrinkles, which curve regularly outwards and backwards toward the shoulder, and do not form a buckler over the forehead. The bull is ashy-black in color, frequently with white feet, and is smaller than the African buffalo, never exceeding 16 hands at the withers. It is in the wild state an animal of tremendous power and ferocity, and is regarded by sportsmen as one of the most dangerous beasts of the jungle. It has long been employed in the rice-fields of the Orient, as far east as Japan; the ordinary «water-buffalo» or «carabao» of the Philippines is a small variety. It was long ago introduced into Egypt for service in the boggy lowlands of the Delta, and is now extending up the Nile to the lake regions of central Africa. A variety exists in the Niger Valley, and another, called «sanga,» and distinguished by its very long horns, is domesticated in Abyssinia. The Indian buffalo is also employed in marshy farming districts in Turkey, Hungary, Italy and Spain, where it is able to work in ground too wet and soft for the other cattle, and to pasture upon coarse, marsh grasses. Its hide makes good leather, and its milk is excellent, and is greatly used in India for the making of the semi-fluid butter called «ghee.» See BISON.

BUFFALO-BERRY, (*Lepargyrea argentea*), an American shrub of the family *Elæagnaclæ,* occasionally cultivated in the Western plains region for its edible berries, and planted for hedges, wind-breaks and ornament to some extent elsewhere. The plant, which is sometimes a tree, attains a height of about 18 feet, has thorny stems, small, silvery leaves, yellowish densely fascicled diœcious flowers at the nodes, and globular, one-seeded, yellow or red tart fruits, about the size of currants. The fruits make acceptable jellies and preserves. The plants are readily propagated by means of seeds, cuttings and occasional suckers. They succeed in any good garden soil.

BUFFALO BILL. See CODY, WILLIAM F.

BUFFALO-BIRD, any of several birds which remain about cattle, and feed upon their parasites. Most of them are starlings (q.v.) of plain dark plumage, with the habit of gathering into noisy flocks. Those of South Africa, almost always seen in company with buffaloes and rhinoceroses, belong to the genus *Buphaga,* and are commonly termed «ox-peckers,» «beef-eaters» or «rhinoceros-birds.» They cluster upon the backs of these animals while they rest or slowly feed, and pick from them ticks and similar pests; and they also serve as watchmen for their hosts, arousing them by their cries whenever anything suspicious happens. The wild and tame buffaloes of the Orient are similarly attended by the starlings of the genus *Eulabes.* These wait about the villages until the cattle come in from pasture at sunset, when the birds throng about them, and relieve them of troublesome insects, to the manifest comfort of the resting cattle. In Africa the larger mammals are frequently served in the same way by certain small, white herons, also called «buffalo-birds» by the colonists.

BUFFALO BUG. See Carpet Beetle.

BUFFALO-FISH, a large, coarse, fresh-water fish of which there are four varieties; three inhabiting the waters of the Mississippi Valley, and one the river Usumacinto in Mexico. The formation of the head suggests the name, for from the nose to the top of the shoulders it has the high, humpy pitch of the bison. In Louisiana they are known as «gourd-heads.» The common big-mouthed buffalo-fish (*Ictiobus cyprinella*) reaches a length of three feet and a weight of 50 pounds. In the spring freshets of the Mississippi Valley, at spawning time, it swims in great shoals on to the flooded marshes, where the receding waters make it an easy victim to the farmers, who kill great numbers of them for fertilizers. In body they are stout and of a dull, brownish-olive hue, not silvery, with dusky fins. The black, or mongrel, buffalo-fish (*I. urus*) has a smaller, more oblique mouth, and a much darker color; the fins being almost black. The small-mouthed or white, buffalo-fish (*I. bubalus*) is the most abundant. It does not run so large as the common buffalo, 35 pounds being its limit. In color it is pale, almost silvery. Consult Jordan and Evermann, ‘American Food and Game Fishes.’

BUFFALO-GNAT, a fly allied to the black-fly (q.v.), *Simulium pecuarum,* of the family *Simuliidæ,* order *Diptera,* a larger and more formidable species than the black-fly of the northern and subarctic regions. It attacks in the lower Ohio and the Mississippi Valley various domestic cattle, horses, sheep, poultry, dogs and cats, and is especially hurtful to mules and horses, killing many. Hogs show at first the effects of the bite but very little; yet large numbers die soon after the attack, while others die about six weeks after the disappearance of the buffalo-gnats; they usually perish from large ulcerating sores, which cause blood-poisoning. Animals bitten by many buffalo-gnats show all the symptoms of colic, and many people believe that these bites bring on that disease. The animal attacked first becomes frantic, but within a very short time ceases to show symptoms of pain, submits passively to the affliction, rolls over and dies; sometimes all within the space of three or four hours. Animals of various kinds become gradually accustomed to these bites, and during a long-continued invasion but few are killed toward the end of it. The larvæ are found more particularly attached to submerged logs, wholly or partly submerged stumps, brush, bushes and other like objects in the larger creeks and bayous of the region to which they are common. They cluster together, and fastened by the posterior protuberance or by a minute thread, they wander and sway about, but do not venture above the water. When fully grown the larvæ descend to near the bottom of the stream, sometimes 8 or 10 feet, to make their cocoons. The adult fly, on emergence from the pupa, rises quickly to the surface, runs a few inches over the water, and the wings expanding almost instantly it darts away. The time of appearance of the swarms is regulated by the earliness or lateness of the spring, and consequently it is much earlier in the southern parts of the Mississippi Valley. As a rule, they can be expected soon after the first continuous warm weather in early spring. In 1885 the first swarms were observed in Louisiana, 11 March, in Mississippi and Tennessee, 1 May, and in Indiana and Illinois, 12 May. Their presence is at once indicated by the action of the various animals in the field. Horses and mules snort, switch their tails, stamp the ground and show great restlessness and symptoms of fear. If not harnessed to plow and wagon they will try to escape by running away. Cattle rush wildly about in search of relief. Consult Osborn, ‘Insects Affecting Domestic Animals’ (Bulletin 5 n. ser. United States Department of Agriculture, Division of Entomology, 1896).

BUFFALO GRASS, a name applied to two grasses of western North America, *Bulbilis dactyloides* and *Boutcloua gracilis,* so called because they formed a large part of the food of the buffalo. Both are important forage grasses. The latter is perhaps more widely known as blue grama.

BUFFALO HISTORICAL SOCIETY. Foremost among institutions of its kind west of New England and the older Atlantic seaboard cities is the Historical Society of Buffalo, N. Y. Founded in the spring of 1862, Millard Fillmore was its first president, and it was at his suggestion that 50 citizens of Buffalo agreed to pay $20 each per year for five years, thus founding the first maintenance fund in the institution. In President Fillmore's inaugural address, 2 July 1862, the principal objects were stated to be to «discover, procure and preserve whatever may relate to the history of western New York in general and the city of Buffalo in particular.» For many years the Society occupied various leased quarters, with its small museum and library; its progress was slow, but throughout its more than 40 years of existence it has always included among its members the most substantial and representative families of Buffalo. Grover Cleveland was a member, and Wilson S. Bissell, afterward Postmaster-General in President Cleveland's Cabinet, was one of its managers. From 1887 to 1902, the society occupied rooms in the Buffalo Public Library building. The nucleus of a building fund has been formed by a gift of $5,000 from Hon. James M. Smith, and various building projects had been under consideration when, in 1900, legislation incident to the construction at Buffalo of a building for New York State at the Pan-American Exposition opened the way for securing a permanent and worthy home for the institution.

Mr. Andrew Langdon, president of the Society 1894–1910, was the first to suggest an historical building on park lands and was tireless in his well-directed efforts to secure it. Assisted by the Hon. Wilson S. Bissell, he prevailed upon Governor Roosevelt to permit the employment of a local architect to design the New York State building at the Pan-American Exposition and supervise its construction. George Cary of Buffalo was engaged for that purpose and designed the beautiful building of Doric architectural style, that was used at the Pan-American Exposition as the New York State building, and now houses the possessions of the Buffalo Historical Society. Through the efforts of Senator Henry W. Hill, aided by Hon. Wilson S. Bissell, Andrew Langdon and others, a bill was enacted which enabled the State to expend $100,000 out of its Exposition appropriation of $300,000 toward the erection of a permanent building and also provided for adding thereto $25,000 from the city of Buffalo and funds from the Historical Society, said building to be placed on park lands and at the close of the Exposition to become the property of the Historical Society, the city being bound to make an annual appropriation toward its maintenance. Under this agreement a building was erected in Delaware Park at a cost of some $200,000. The only permanent building connected with the Pan-American Exposition, it has the added interest of being the scene of President McKinley's last public reception, 5 Sept. 1901, prior to that held the next day in the Temple of Music at which he received the wound from which he died 14 September.

The Historical Building stands in a beautiful and easily accessible site in Delaware Park, the principal park of Buffalo. It is 130 by 80 feet in dimensions, 50 feet high, perhaps the most notable example in America of the Doric order of architecture. It is of white marble, the northern façade faced with three-quarter columns, the south side having a portico 61 by 17 feet, embellished by 10 Doric columns and approached by marble steps 40 feet in width. The columns are of the same proportions as those of the Parthenon, three feet six inches in diameter at base. Within the chief structural material is black marble. Standing on sloping ground, the edifice has three available floors, the basement being for the most part but little below the ground level. In the middle of the main floor is the grand hall, two stories high and lighted, as is the upper floor, by side windows and skylights. The library, lecture-hall and administrative offices are on the main floor, the museum and portrait galleries above. A notable feature of the building is the massive bronze doors, presented by Andrew Langdon, the design of J. Woodley Gosling, the sculptural work by R. Hinton Perry, the principal panels bearing female figures typifying «History» and «Ethnology»; the bronze transom contains a group showing «Science» and «Art.» In the central hall is a bronze statue of Lincoln, Charles H. Niehaus, sculptor, a gift to the Society from the Lincoln Birthday Association of Buffalo, now affiliated with it. Here also have been erected bronze tablets, in memory of two residents of Buffalo who became Presidents of the United States, Millard Fillmore and Grover Cleveland.

Mr. Langdon's gifts include bronze and marble busts and tablets, antique Italian candelabra, etc. Mr. Langdon was also the donor to the city and to the Buffalo Historical Society of the replica in bronze of the «David» by Michelangelo that adorns that part of Delaware Park facing the Buffalo Historical Society building; it is the only replica of this work in America.

The museum includes the Dr. F. H. James coin and medal collection, valued at $15,000; the Dr. Joseph C. Greene collection of Egyptian and Oriental articles, casts, etc.; the Cottier, Scoville and other Indian collections; the Atkins Alaska collection; the Civil War and Lincoln collection of Julius E. Francis, founder of the Lincoln Birthday Association; the William A. Galpin collection of Washington and Lincoln portraits and engravings illustrating great events in American history; and many relics of the pioneer days in western New York and on the Great Lakes. Many articles formerly belonging to President Millard Fillmore are shown, as are relics of Lincoln, Grant and other Presidents and famous men. The Historical Society library (40,000 volumes) is a free reference library, chiefly devoted to American history. It includes the special collection known as the Dr. John C. Lord library, owned by the city of Buffalo, but cared for by the Historical Society, and the private library of Mrs. Millard Fillmore. It is also rich in manuscript material relating to western New York and the Great Lakes.

The Society is active in historical publishing, having issued 19 volumes — 15 of them since 1902; some miscellaneous in character, others of national scope and interest. Among them are the works of Hon. Henry W. Hill, president of the Society since 1910, on New York State waterways, canals and allied topics; the 'Millard Fillmore Papers' (2 vols.), being the correspondence, addresses, etc., of President Fillmore, collected and edited by Frank H. Severance, secretary of the Society. Several other volumes by this writer present various phases of Niagara regional history. The Buffalo Historical Society makes its collections and facilities free to the public, maintains courses of lectures and co-operates with the schools and other organizations of Buffalo. Its building is one of the most useful as well as one of the most interesting and beautiful places in Buffalo.

BUFFER, any elastic apparatus or cushion attached to the end of a car to receive and absorb shocks caused by other cars running against it. The term is generally applied to those attachments in which springs are used to give the apparatus elasticity. In the United States the buffers used on passenger cars are composed of a head, bar and stem and are placed at the centre of each end of the car. The stem passes through the spring and beam, and the shoulder thus formed bears against the spring by means of a plate which bears and rubs against the opposing plate of the next car of the train. On English railways they are placed in pairs at each end, and are fastened by rods to springs under the framework to deaden the concussions caused when the velocity of part of the train is checked.

BUFFET, Louis Joseph, French politician: b. Mirecourt, Vosges, 26 Oct. 1818; d. 1898.

In 1848 he was elected to the Chamber of Deputies from the Vosges, and held the position of Minister of Commerce and Agriculture under the presidency of Louis Napoleon. He then took a prominent part in the «Tiers Parti,» which sought to join liberal reforms to loyalty to the government, later becoming its leader. He became a member of M. Emile Ollivier's Cabinet in January 1870, occupying the portfolio of Minister of Finance, but after only three months' service resigned. In 1871 he was again elected to the National Assembly, of which he was elected president to succeed M. Jules Grévy, 4 April 1873. In 1875 he formed a new Cabinet, becoming himself vice-president of the council and Minister of the Interior, but owing to his having made himself unpopular with the members of his own party, he failed of re-election to the Assembly, and resigned his seat in the Cabinet in 1876. He was, however, in June of the same year elected a life member of the Senate.

BUFFET, bůf-fā', anciently a little apartment, separated from the rest of the room, for the disposing of china, glass, etc. It is now a piece of furniture in the dining-room, called also a side-board, for the reception of the plate, glass, etc. In France many mansions have a detached room called *buffet*, decorated with pitchers, vases, fountains, etc. The word is very commonly applied to the space set apart for refreshments in public places.

BUFFINGTON, Adelbert Rinaldo, American army officer: b. Wheeling, W. Va., 22 Nov. 1837. He was graduated at the West Point Military Academy 1861; was brevetted major in 1865, and was commander successively of the United States ordnance depot at Wheeling, W. Va., and of the arsenals in New York, Baton Rouge, Watertown, Mass., Watervliet, Indianapolis, Pittsburgh, Springfield, Mass., and Rock Island. In 1899 he was appointed chief of ordnance and was raised to the rank of brigadier-general; was retired in 1901. He is the inventor of depressing carriages for heavy guns, light steel artillery and shielded machine gun carriages, novel road and recoil brakes, magazine small arms and parts of small arms; of which all that were used by the United States government were given to it without cost. He is a life member of the Graduates' Association of the United States Military Academy, the Luther Burbank Society and the American Tract Society.

BUFFLEHEAD, a small plump duck of American inland waters (*Charionetta albeola*), remarkable for its beauty of coloring. It is about 13 inches in length, and the plumage of the drake is black and white, with the crested head, shaped like a puff-ball, rich, silky, changing green. The female is smaller, and more protectively colored in a dull-brown plumage, with white markings. Its food consists of larvæ, shells, seeds, etc., and it frequents gravelly shores and wooded ponds, breeding in holes of trees and burrows, from the Great Lakes northward to the Arctic Circle. It lays about 12 large, dark-colored eggs. It is of small value to the sportsman, and requires little skill in shooting, except when on the wing, at which time it is remarkable for the speed with which it flies, and the peculiar whistling sound of its wings. It is sometimes called «butterball,» because of its roundness, and «spiritduck,» a name derived from the Indians, owing to its faculty for vanishing and reappearing from the surface of the water with amazing skill.

BUFFON, bü-fôn, **George Louis Leclerc** (Comte de), French naturalist of distinction: b. Montbard, Burgundy, 7 Sept. 1707; d. Paris, 16 April 1788. He received from his father, Benjamin Leclerc, counsellor to the Parliament of his province, a careful education. Chance connected him at Dijon with the young Duke of Kingston, whose tutor, a man of learning, inspired him with a taste for the sciences. They traveled together through France and Italy, and Buffon afterward visited England. In order to perfect himself in the language without neglecting the sciences, he translated Newton's ‹Fluxions,› and Hales' ‹Vegetable Statics.› After some time he published some works of his own, in which he treated of geometry, natural philosophy and rural economy. He laid his researches on these subjects before the Academy of Sciences, of which he became a member in 1733. The most important were on the construction of mirrors for setting bodies on fire at a great distance, as Archimedes is said to have done, and experiments on the strength of different kinds of wood, and the means of increasing it, particularly by removing the bark of the trees some time before felling them. Buffon, in his earlier years, was animated only by an undefined love of learning and fame, but his appointment as superintendent of the Royal Garden (now the Jardin des Plantes), in 1739, gave his mind a decided turn toward that science in which he has immortalized himself. Considering natural history in its whole extent, he found no works in this department but spiritless compilations and dry lists of names. There were excellent observations indeed on single objects, but no comprehensive work. Of such a one he now formed the plan, and to aid him in this, by examining the numerous and often minute objects embraced in his plan, he associated himself with Daubenton, and after an assiduous labor of 10 years, the two friends published the three first volumes of the ‹Natural History›; and, between 1749 and 1767, 12 others, which comprehend the theory of the earth, the nature of animals and the history of man and the viviparous quadrupeds. The most brilliant parts of them, the general theories, the descriptions of the characters of animals, and of the great natural phenomena, are by Buffon. Daubenton limited himself to the description of the forms and the anatomy of the animals. The nine following volumes, which appeared from 1770 to 1783, contain the history of birds, from which Daubenton withdrew his assistance. Buffon published alone the five volumes on minerals, from 1783 to 1788. Of the seven supplementary volumes, of which the last did not appear until 1789, after his death, the fifth formed an independent whole, the most celebrated of all his works. It contains his ‹Epochs of Nature,› in which the author, in a style truly sublime, and with the triumphant power of genius, gives a second theory of the earth, very different from that which he had traced in the first volumes, though he assumes at the commencement the air of merely defending and developing the former. This great labor, with which Buffon was occupied during 50 years, is, however, but a part of the vast plan which he had sketched, and which has been continued by Lacépède in his history of the different species of cetaceous animals, reptiles and fishes, but has remained unexecuted as far as regards the invertebrate animals and the plants. There is but one opinion of Buffon as an author. For the elevation of his views, for powerful and profound ideas, for the majesty of his images, for noble and dignified expression, for the lofty harmony of his style in treating of important subjects, he is perhaps unrivaled. His pictures of the sublime scenes of nature are strikingly true, and are stamped with originality. The fame of his work was soon universal. It excited a general taste for natural history, and gained for his science the favor and protection of nobles and princes. Louis XV raised the author to the dignity of a count, and D'Argivilliers, in the reign of Louis XVI, caused his statue to be erected, during his life, at the entry of the Royal Cabinet of Natural Curiosities, with the inscription «Majestati naturæ par ingenium.» The opinions entertained of Buffon as a natural philosopher and an observer have been more divided. Voltaire, D'Alembert, Condorcet, have severely criticized his hypotheses and his vague manner of philosophizing from general views. But although the views of Buffon on the theory of the earth can no longer be defended in detail, he will always have the merit of having made it generally felt, that the present state of the earth is the result of a series of changes which it is possible to trace, and of having pointed out the phenomena which indicate the course of these changes. His theory of generation has been refuted by Haller and Spallanzani, and his hypothesis of a certain inexplicable mechanism to account for animal instinct is not supported by facts; but his eloquent description of the physical and moral development of man, as well as his ideas on the influence which the delicacy and development of each organ exert on the character of different species of animals, are still of the highest interest. His views of the degeneracy of animals, and of the limits prescribed to each species by climates, mountains and seas, are real discoveries which receive daily confirmation, and furnish to travelers a basis for their observations, which was entirely wanting before. The most perfect part of his work is the ‹History of Quadrupeds›; the weakest, the ‹History of Minerals.› Buffon was of a noble figure and of great dignity of manners. His conversation was remarkable for a simplicity which strikingly contrasted with the style of his writings. The best edition of his ‹Natural History› is that published from 1749–89, in 36 volumes.

BUFFOON (Italian *buffone*), a comic singer in the opera buffa, or the Italian intermezzo. The Italians, however, distinguish the buffo cantate, which requires good singing, from the buffo comico, in which there is more acting. Buffoonery is the name given to the jokes which the buffoon introduces. The word is no doubt borrowed from the Low Latin, in which the name buffo (cheeked) was given to those who appeared on the theatre, with their cheeks puffed up to receive blows on them, and to excite the laughter of the spectators. Afterward the name came to signify a mimic, a jester in general.

BUFO, a genus of batrachians, the type of the family *Bufonidæ*. The body is inflated, the skin warty, the hind feet of moderate length, the jaws without teeth, the nose rounded. At least 20 species are known.

BUFONITE, literally, toad-stone; a name given to the fossil teeth and palatal bones of fishes belonging to the family of *Pycnodonts* (thick teeth), whose remains occur abundantly in the Oölitic and Chalk formations. The term bufonite, like those of serpents' eyes, batrachites and crapaudines, by which they are also known, refers to the vulgar notion that those organisms were originally formed in the heads of serpents, frogs and toads.

BUFORD, John, American soldier: b. Kentucky, 1825; d. Washington, D. C., 16 Dec. 1863. He was graduated at West Point in 1848; was appointed to the 1st Dragoons, and served in the Sioux expedition, 1855, in the Kansas disturbances of 1856–57, and in the Utah expedition, 1857–58. On 12 Nov. 1861 he was appointed major in the inspector-general's corps, attached to General Pope's staff, 26 June 1862, made a brigadier on 27 July, and commanded a cavalry brigade under Hooker in the northern Virginia campaign. He was chief of cavalry in the Maryland campaign, and succeeded General Stoneman on McClellan's staff. He took part in the engagement at South Mountain, Antietam, Fredericksburg and Beverly Ford; and at Gettysburg began the attack before Reynold's arrival on 1 July, and rendered important services at Wolf's Hill and Round Top. After the engagement at Culpeper he pursued the enemy across the Rapidan, and cut his way to rejoin the army north of the Rappahannock. His coolness, fine judgment and splendid courage were notable, and in a few months he acquired an influence over men as remarkable as it was useful. His military sagacity was far-reaching and accurate, and made him one of the most trusted and respected officers in the service, and his death, caused by disease contracted during months of active service and constant exposure, was widely lamented in the army. A major-general's commission reached him the day he died, and a monument to his memory was placed on the Gettysburg battlefield in 1895.

BUFORD, Napoleon Bonaparte, American soldier: b. Woodford County, Ky., 13 Jan. 1807; d. 28 March 1883. He was graduated at West Point, 1827, did garrison duty in Virginia and Maine as second lieutenant in the 3d Artillery, and was assistant professor of natural and experimental philosophy at the Military Academy, 1834–35, when he resigned his commission, became an engineer in the service in the State of Kentucky, 1835–42, and a merchant and iron founder at Rock Island, Ill., 1843–61, being president of the Rock Island & P. Railway, 1857–61. He entered the Civil War as colonel of the 27th Illinois Volunteers, took part in the battle of Belmont, 7 Nov. 1861, the attack on Island No. 10 in the Mississippi River, March–April 1862, captured Union

City, Ky., 31 March 1862, took part in the expedition to Fort Pillow, the siege and battle of Corinth, and the siege of Vicksburg, February 1863. On 24 Aug. 1865, he was mustered out of service with the rank of brevet-major-general of volunteers, conferred for gallant and meritorious services during the Rebellion. He was special commissioner of Indian affairs during 1868, and for inspecting the Union Pacific Railroad, 1867–69. During the negotiations after the battle of Belmont the Confederate Gen. Leonidas Polk wrote of Buford, whom he had known at West Point: «He is as good a fellow as ever lived and most devotedly my friend — a true Christian, a true soldier and a gentleman every inch of him.»

BUG, an insect of the order *Hemiptera.* Bugs are characterized by the beak-like sucking mouth-parts, composed of the mandibles and maxillæ, which are ensheathed by the large expanded labium; by the free, large prothorax, the usually angular short body, and the irregularly veined wings, the veins being but few in number, while the fore wings are often half coriaceous and thick. The metamorphosis is incomplete. There are many wingless parasitic forms, and many aquatic species.

The triangular head is nearly always sunken into the prothorax, and is small in proportion to the rest of the body; the eyes are small, nearly globular, and very prominent, and the three ocelli are set far back, while the short, bristle-like, or filiform antennæ, with from 5 to 13 or more joints, are inserted below and far in advance of the eyes, so that the front is broad and flat. The parts of the mouth form a four-jointed, solid, hard beak. The mandibles and maxillæ are long and style-like, the latter without palpi; they are ensheathed at their base by the canaliculate labium, which has obsolete palpi. The labium is well developed, being generally acutely triangular. The thorax is like that of beetles, the prothorax being broad above, and the wings, when folded, concealing the rest of the body. The legs are situated close together, with coxæ and trochanters very similar to those of the *Coleoptera.* The body is usually very flat above, or, in the more or less cylindrical species, somewhat broad and flat. The body is less concentrated headwards than in the *Coleoptera,* though much more so than in the *Orthoptera,* and in this respect, as well as in other essential characters, the group is intermediate between these two orders. Both pairs of wings are very equal in size and alike in shape, except in the higher families, where they are very unequal, the hinder pair being very small.

The legs are slender, and often very long, owing to the great length of the femora and tibiæ, while the tarsi, like those of the lowest *Coleoptera,* are two- or three-jointed. The abdomen has six to nine segments apparent, though the typical number is 11. The stigmata are very distinct, being often raised on a tubercle. On the basal ring of the abdomen are two cavities in which are sometimes seated vocal organs, as in the male cicada, and in the metathorax of some species are glands for secreting a foul odorous fluid. In the *Cicadidæ* and *Phytocoris* the ovipositor is perfect and much as in the saw-flies and wasps.

The active nymphs of the *Hemiptera,* like those of the locusts, resemble closely the imago, differing mainly in possessing the rudiments of wings, which are acquired after the second molting. After two changes of skin (four in all) they assume the pupa state, which differs mainly from that of the larva in having larger wing-pads. While the development of the imago ordinarily occupies the summer months, in the *Aphides* it takes but a comparatively few days, but in the 17-year cicada as many years as its name indicates. An exception to this mode of development is seen in the nymph of the male coccus, which, somewhat as in the higher orders, spins a silken cocoon, and changes into an inactive pupa. Apterous individuals, especially females, sometimes occur, especially in the aquatic *Hydrometra, Velia* and *Limnobates,* and in many other genera the hind pair of wings are often absent. There are about 50,000 species living and fossil. Some species are of great size, especially the *Hydrocores,* a division containing the aquatic genera, *Velia, Nepa, Belostoma* and *Notonecta,* and which first appeared in the Jurassic formation. But the oldest known fossil insect (*Protocimex silurica*) was apparently a bug; traces of one wing having been found in the Upper Ordovician beds of Sweden. Consult Packard, 'Guide to Study of Insects' (1889); 'Entomology for Beginners' (1899); Comstock, 'A Manual for the Study of Insects' (1895); Sharp, 'Insects (1899).

BUG, two rivers in European Russia. One rises near the confines of Volhynia, in the northwest of government Podolsk, and proceeds first east and then southeast to Oliviopol, where it enters government Kherson, which it traverses almost centrally from north to south, and falls into the estuary of the Dnieper, near Kherson. Its chief affluents are the Ingul, Balta, Tchertal and Solonicha. It has a course of 500 miles, but its navigation is greatly obstructed by rocks and sandbanks. The second river rises in Galicia and joins the Vistula at the fortress of Novogeorgieosk, about 20 miles north-northwest of Warsaw. It is navigable for nearly 300 miles.

BUGASON, boo-ga-sōn', Philippines, a town on the island of Panay. Pop. estimated about 15,000.

BUGBANE, a genus of herbs (*Cimicifuga*), of the family *Ranunculaceæ,* tall perennial plants, of which some 10 species are natives of the northern temperate regions, and are often planted, in spite of their disagreeable odor, for ornamental purposes in hardy borders in exposed places or in partial shade. The species have large decompound leaves, and racemes of white flowers, which appear during summer and early autumn. In some species the fruits are attractive in appearance. One species, black cohosh, or black snakeroot (*C. racemosa*) is used in domestic and rural medicine as an infusion for various ailments.

BUGEAUD DE LA PICONNERIE, bü-zho-dė-lạ-pē-kōn-ė-rē, **Thomas Robert** (Duc d'Isly), marshal of France: b. Limoges, 15 Oct. 1784; d. Paris, 10 June 1849. He belonged to an Irish family which had settled in France with James II on his abdication. He entered the army in 1804 as a grenadier, was corporal at Austerlitz, made the campaigns of Prussia and Poland, and was wounded at Pultusk in 1806. He afterward went into Spain as lieutenant adjutant-major, gained new promotion and remained with the army of Aragon till 1814. During these long wars he repeatedly distinguished himself, and received honorable mention from Suchet, his commander-in chief. On the restoration of the Bourbons he gave his adhesion to them; but on the landing of Bonaparte, followed the general example by deserting to his old master. After the revolution of 1830 he was appointed *maréchal de camp,* and in 1831 obtained a seat in the Chamber of Deputies, where he often displayed great good sense, though in a style of oratory so blunt and rustic as occasionally to excite the risibility of his opponents. He was afterward sent to Algeria, where he gained many advantages over the Arabs, and showed himself possessed of the kind of talents necessary to cope successfully with them and their celebrated leader, Abd-el-Kader. On the revolution of 1848, it is said that, if permitted, he would have effectually put down the insurgents and secured the throne to Louis Philippe. He yielded in his adhesion to the republic, but remained unemployed. He was better received by President Louis Napoleon, who appointed him commander-in-chief of the army of the Alps.

BUGENHAGEN, boo-gĕn-hä'gĕn, **Johann,** called POMERANUS, or DOCTOR POMMER, German reformer: b. Stettin 1485; d. Wittenberg, 20 April 1558. He fled from his Catholic superiors to Wittenberg in 1521, where he was made, in 1522, professor of theology. Luther derived assistance from his profound exegetical learning in preparing his translation of the Bible. In 1525 he gave occasion for the controversies about the sacrament, by a work against Zwinglius on the communion. He acquired more reputation by his 'Interpretatio in Librum Psalmorum' (1523). He effected the union of the Protestant free cities with the Saxons, and introduced into Brunswick, Hamburg, Lübeck, Pomerania, Denmark and many other places the Lutheran service and Church discipline. For the Lower Saxons he translated the Bible into Low German (1533). He was a faithful friend to Luther, and delivered his eulogy. Together with Melanchthon, he composed the 'Interim of Leipzig.' He wrote also a 'History of Pomerania.'

BUGGE, bŭg'gĕ, **Elseus Sophus,** Norwegian philogist: b. Laurvig 1833; d. Christiania, 8 July 1907. After obtaining an education at the Universities of Christiania, Copenhagen, and Berlin he was made professor of comparative philology and Old Norse, at Christiania. He was an eminent authority on northern languages and among his works are an edition of the songs of the Edda, 'Norroen Fornkvoedi' (1867); 'Gamle norske Folkeviser' (1858); 'Norroene Skrifter of sagnhistorik Indhold' (1864–73); and a notable edition of the Volsunga and Hervarar sagas. An English translation was published under the title 'The Home of the Eddic Poems' (London 1899). He was a most brilliant scholar and made very fine studies in the Romance, Celtic, Oscan, Umbrian and Etruscan languages.

BUGGE, Thomas, Danish astronomer: b. Copenhagen, 12 Oct. 1740; d. 15 June 1815. After Tycho Brahe, he was the greatest astronomer of Denmark. First officiating as professor, he afterward spent most of his time in traveling abroad, and was sent to Paris in 1798 to confer with the commission of the French Institute on the subject of the introduction of uniform weights and measures, on which occasion he was made a member of that learned body. He has left many valuable works on mathematics and astronomy.

BUGGY, a name given to several species of carriages or gigs: In the United States a light one-horse four-wheeled vehicle with or without a hood or top; in India, a gig with a large hood to screen those who travel in it from the sun's rays; in England, a light one-horse two-wheeled vehicle without a hood.

BUGIARDINI, boo-jär-dē'nē, **Giuliano,** Italian painter (also known under the Latinized form of his name, as JULIANUS FLORENTINUS): b. Florence, 29 Jan. 1475; d. 16 Feb. 1554. He studied under Ghirlandajo and Albertinelli, and collaborated with Michelangelo. Among his best works are 'The Martyrdom of Saint Catherine'; 'Betrothal of Saint Catherine'; 'John the Baptist'; 'Virgin with Saints'; 'Virgin with John the Baptist.'

BUGIS, boo'jēz, a people of the Indian archipelago, chiefly inhabiting Macassar and Boni, in the island of Celebes. They profess the religion of Islam, have a literature and alphabet of their own and have more liberal governmental institutions than any of the other peoples of the Celebes. They are muscular, middle-sized and of a light-brown color, some being even fair. Their dress consists of a piece of red or blue striped cotton, which they wrap about their loins, and pass between their legs. They bind their jet-black hair very tastefully, in a red or blue cotton handkerchief. They pluck out the hair of their beards, and ornament their arms and legs with brass wire above the wrists and ankles, and to these the children attach bells. They are, to a notable degree; proud, passionate, revengeful and crafty; yet they are regarded as the most civilized of the natives of Celebes, and are the chief trading people in the Malay archipelago. Their fondness for commerce has led to their settling in many places out of Celebes, and a «Bugis quarter» is to be found in most of the large towns of the different islands. They build ships of 50 or 60 tons burden, and their voyages extend from Sumatra to New Guinea. From Macassar the voyage begins with the east monsoon, the prahus trading as they proceed west until they reach Rhio, and even Malacca and Acheen, when they are prepared to return with the change of the season. They take with them native cotton cloths, gold-dust, nutmegs, silver dollars, birds'-nests, camphor, benzoin or frankincense and tortoise shell; and return with European broadcloths and cottons, opium, unwroght iron and tobacco, which they partly sell at the intermediate ports as they sail homeward. This is their most important voyage, but they make many subordinate ones for collecting birds'-nests, feathers, tortoise shell, trepang and other articles of commerce. Consult ten Brink, P. B. van S., 'Zuid Celebes' (1884).

BUGLE, a wind instrument of far carrying and penetrating tone used for signalling. It is generally made of copper or brass and in its commonest form is devoid of all valves and keys. It can thus produce only certain notes, and those most commonly employed in the calls are contained in the major triad. In shape the bugle is a long, gradually tapering tube, bent three or four times to ensure portability, has no regular bell, but ends in a tapering cone. It is usually made tuned in B-flat, C, E-flat. More complicated instruments are made with keys and valves but are of no use in the symphony orchestra, and the ordinary one described above is the one generally employed in the army. The infantry bugle has a narrower tube, is not bent so many times and has a more clearly marked bell. The history of the bugle dates from the very earliest times, having its archetype in the old ram or bull's horn. The corresponding wind instrument in Hebrew times was the shofar. In Rome it was also used for military purposes. We even find in the British Museum a bugle which dates back to the Bronze Age in Denmark. In the Middle Ages the word was applied to the ox or its horns, whether used for drinking or music. As a military instrument in England it was introduced in the 17th century.

BUGLE, a shining elongated glass bead, usually black, used in decorating women's apparel and also in trafficking with savage tribes.

BUGLE CALLS. The soldier's day usually begins with a march played by the drummers to awaken him in the morning. About five minutes thereafter the *first call* is sounded, to warn of *reveille* five minutes later still. Soon there follows the *assembly* for morning roll-call, and after this the *mess-call,* familiarly known as the «come-and-get-it.» After morning mess, first call is again sounded, to warn the men to prepare for drill, schools or some other formation, the nature of which is indicated by the next call. Each formation is immediately preceded by the assembly. The *adjutant's call* is the signal for the formation of battalions from companies or regiments from battalions. The morning's work is terminated by the *recall.* In the afternoon a similar sequence of calls is gone through. At about half-past five in summer there is a formation for retreat. *Retreat* is played with the troops at «parade rest.» At «to the color,» which follows immediately, the troops present arms. After evening mess and any school calls that may follow, the next call is the *tattoo,* to warn that all men should return to quarters and that work is over for the day. At *call to quarters,* half an hour thereafter, all men must be in their quarters, and in 15 minutes *taps* follows, at which all lights must be extinguished and all noise must cease. Taps is also played over the grave of a dead soldier. Besides these calls there are several warning calls, such as the *alarm,* the *fire call, to arms!, to horse!, fix bayonets!, to the charge!, charge!* Other calls indicate the equipment or uniform, such as *boots and saddles, overcoats,* etc. Still other calls are employed in various ceremonies.

BUGLE-WEED, a genus of hardy herbs (*Ajuga*), of the family *Menthaceæ,* mostly natives of the cooler parts of Europe and Asia, but cultivated for ornaments in many temperate countries. The plants have many whorls, usualy of blue, purple, pink or white flowers, and are useful for planting in the rear of borders. They are readily propagated by seeds or division. Some of the species have escaped and may be found growing wild on moist land and in the borders of woods.

BUGLOSS, a popular name for various species of the genera *Anchusa, Lycopsis* and *Echuim,* of the natural order *Boraginaceæ.* Several species of *Anchusa,* which is also known as alkanet, are cultivated for ornament. They are hardy, have blue or purple blossoms in panicled racemes, which are used as cut flowers. The plants are easily raised from seed and thrive well in sunny places. The species of *Lycopsis,* to which some botanists restrict the name bugloss, are not cultivated in America, but in some parts of Europe certain ones, especially *L. arvensis,* are considered weeds. Several species of *Echium,* popularly known as viper's bugloss, are cultivated under glass in Europe and America, especially in California, where three species are grown out of doors. They are coarse herbs or shrubs which bear beautiful spikes of very numerous white, blue, red or violet flowers with prominent stamens. They are particularly useful where the soil is too poor for many other garden plants, because they produce more numerous and more highly-colored blossoms upon such soils than upon rich soil. Indeed, upon rich soil they may fail to blossom altogether.

BUGONG MOTH, a species of owlet-moth *Agrotis spina* of the family *Noctuidæ.* It occurs in millions in certain localities in Victoria, Australia. It hibernates as a moth, and in this stage was formerly an important article of food with the native tribes.

BUGONIA MYTH, also «Bugonia lore,» «Bugonia craze» and «Bugonia superstition.» For more than 2,000 years a superstition has prevailed among the masses that besides the usual production of honey-bees in hives, they originated by spontaneous generations from the carcasses of dead animals, and chiefly from those of oxen. Thus, says Osten Sacken, arose in Greece the term Bugonia (from Βομς ox; and *τονή* progeny) as well as the Latin names Bugenes melissae or Taurigenæ apes, «oxen-born bees.» Greeks, Carthaginians and Romans spoke of the Bugonia as an every-day occurrence. The poet Archelaus calls them the «factitious progeny of a decaying ox.» This superstition has also prevailed in northern Africa and some parts of Asia; it continued to exist through the Middle Ages and survived till the 16th and 17th centuries, being mentioned by Redi, Aldrovaldi (1602), while Melanchthon regarded it as a divine provision. The original cause of this delusion, which has been finally exploded by Osten-Sacken, lies in the fact that a fly which mimics the honey-bee in shape and its hairy clothing (*Eristalis tenax,* of the order *Diptera*), and which breeds in the carcasses of animals, has always been mistaken for the honey-bee. It is a true fly, with only one pair of wings and no sting, and is a little stouter and larger than a honey-bee. Its larva is the «rat-tailed maggot,» that lives in open cess-pools, sewers, etc., and decaying carcasses on which the corrupt liquid forms during the secondary stage of putrescence. The Bugonia myth is, as shown by Osten-Sacken, the foundation of Samson's riddle; the supposed honey-bee issuing from the lion's carcass was evidently the Eristalis fly. This insect is now distributed over a greater part of the world and is abundant in the United States. It was first detected at Cambridge, Mass., in 1875 by Osten-Sacken himself. Consult Osten-Sacken on the Oxen-born Bees of the Ancient (Bugonia) and their relation to *Eristalis tenax*.

BUHACH, a preparation for destroying insects made by grinding the flower-heads of certain species of chrysanthemums.

BUHL, bool, **Frants**, a Danish philologist and Arabian and Oriental scholar: b. Copenhagen 1850. He was educated at the Metropolitan School, later studied theology and made special studies in Oriental languages. At the age of 30 he was appointed lecturer and, 10 years later, professor of Old Testament theology at the University of Leipzig. In 1898 he was called to the University of Copenhagen to fill the chair of Semitic and Eastern philology. He was university rector in 1911–12. Among Buhl's published works are ‹Den gammeltestamentlige Skriftoverlevering› (1885); ‹Jerusalem paa Christi og Apostlenes Tid› (1886); ‹Fortolkning til Jesaja› (1889–94); ‹Palæstina› (1890); ‹Det israelitiske Folks Historie› (1893); ‹Psalmerne eversatte og fortolkede› (1900); ‹Muhammeds Lif› (1903).

BUHLWORK, a description of inlaid work, consisting at first of inserting a brass scroll or pattern in a ground of dark-colored tortoise-shell or wood; but at a later period the use of wood of a different color, instead of metal, was introduced by Reisner, and to his process the modern practice of buhlwork is chiefly confined. It consists in cutting out a pattern from two veneers of different colored woods, which are glued together with a piece of paper laid between them; the pieces are then separated by running a thin knife through the paper, the patterns are carefully taken out, and the figure removed from the one veneer is inserted into the cavity of the other, the dust of the wood being rubbed in to fill the interstices. A little glue is then rubbed in, and the work laid aside to dry, after which it is ready to be glued to the box or piece of furniture which it is wished to ornament. The cutting of the pattern is effected by the use of a very fine saw, of the kind known as a key-saw, which can readily be made to run around the sinuosities of the patterns. The suitable designs for this work are continuous figures like a running vine or the honeysuckle, the saw completing these without the necessity of discontinuing the work to commence anew. Two pieces of buhlwork are thus produced; but three are frequently obtained by gluing together three pieces of wood and cutting out in the same manner. It is not, however, found expedient to combine a greater number of pieces. The French term for buhlwork and all sorts of inlaid work is marqueterie. The name buhl is derived from a French cabinet-maker, André Charles Boulle or Boule, formerly miscalled Buhl, b. 1642; d. 1732. He raised cabinet-making to an art industry, and Reisner, above mentioned, was a German contemporary of Boulle's.

BÜHLER, bü'lĕr, **Johann Georg**, German Orientalist: b. Berstel, Hanover, 19 July 1837; d. April 1896. He pursued his studies in Göttingen, Paris and London, and in 1863 accepted the chair of Oriental languages in Elphinstone College, Bombay. Among his other labors while in India, he undertook tours into various provinces in search of ancient manuscripts, portions of his collections going to enrich the libraries of European universities. Returning from India in 1880, he became professor of Sanskrit and Indology in the University of Vienna. The breadth and accuracy of his knowledge in various departments of Oriental learning made him an ultimate authority. He collaborated in 1868 in the establishment of the Bombay Sanskrit Series, in 1867–84 in the production of a ‹Digest of Hindu Law,› and in 1887 in the founding of the ‹Wiener Zeitschrift für die Kunde des Morgenlandes.› His work upon the ‹Grundriss der Indo-Arischen Philologie und Alterthumskunde› was interrupted by his death from drowning in Lake Constance.

BUHRSTONE (ber), or **BURRSTONE**, a variety of quartz containing many small, empty cells, which give it a peculiar roughness of surface. They are used principally as millstones. The best kinds are creamy-white, with a granular and somewhat cellular texture, and are obtained in the Tertiary formation of the Paris basin and chiefly at La-Ferté-sous-Jouarre. They are cut into wedge-shaped parallelopipeds, called panes, which are bound together with iron hoops to form large millstones. Numerous substitutes for the French buhrstone have been found in the United States, the most important being furnished by the buhrstone rock of the bituminous coal measures of northwestern Pennsylvania and eastern Ohio but they cannot compete in the great markets with the French rock. Buhrstone is also the local name of an Eocene (q.v.) formation in Alabama.

BUILDING, in the United States. The remarkable physical development of the United States in the last 20 years, with its attendant increase of wealth, is most strongly evidenced in the number of buildings of every character constructed during that period throughout the country. As an incentive to artistic improvement, and an example of co-operated effort and grouping of buildings, the World's Fair at Chicago, re-echoed in varying forms at the expositions of Atlanta, Nashville, Buffalo, Saint Louis and San Francisco, undoubtedly have exerted a strong influence. Many new schemes of magnitude have been projected along lines which will require years for their completion, but the start has been made intelligently and with a view to the final result. It is only necessary to cite the Municipal Building in New York city, the University of California and of Washington University, at Saint Louis, to suggest the power of this influence. The business and residential sections of the larger cities — and, it might almost be added, the outlying suburban districts — have undergone in many instances a complete transformation. The improvement and expansion of the steel, cement, brick and terra-cotta industries (qq.v.) have done more to facilitate this transformation within the cities proper than any other causes. Fortunately the allied mechanical and decorative arts have kept pace with them, and in spite of the popular feeling that our cities are for the most part unsightly, they are more cosmopolitan, convenient and interesting as to their buildings than ever before.

For the large majority of new buildings the systems of construction hitherto in vogue have been used without great change, and probably will continue to be so used. We must therefore look for signs of structural development, rather, to the constructions commonly designated slow-burning, steel-skeleton and fireproof.

In point of materials and possibilities of decorative effect, the architect's palette has been extended to an incredible degree. Facilities of transportation make it possible to use granites, marbles, all kinds of stone, brick and woods, ornamental bronze and iron, the most approved systems of plumbing, heating, lighting and elevators, without approaching the domain of extravagance and even without overstepping the limits of true economy. There has been a steady tendency toward more stable, permanent and beautiful construction,— the outgrowth of public sentiment, which in its turn has been stimulated by the results attained. It would have been quite impossible 20 years ago, even had individual fortunes at that time been large enough to create the demand, to build the palatial residences, churches, hotels and office buildings which we now look upon as commonplace, for in many trades skilled artisans were not to be had and the difficulties of securing proper materials were too great.

Steel structural building of the commercial type has advanced to such an extent, and involves such colossal operations, that vast corporations have been formed for this especial purpose. These corporations are affiliated with financial institutions seeking investments, with owners of real estate desiring to make improvements and with large manufacturing concerns furnishing materials of construction, so that the necessary conditions for undertakings of importance are kept constantly related. The Fuller Construction Company, The Norcross Brothers Company, The Wells Brothers Company and others of a similar nature, carry on a business chiefly made up of steel structural buildings aggregating many millions of dollars per annum, and widely scattered throughout the United States. These companies employ armies of men, covering every building trade and involving details of office management, methods of erection and finishing, transportation and storage of materials, and the harmonizing of the various and often conflicting elements entering into such undertakings, which are almost incredible and can be appreciated only after the most minute investigation. It may be said in general that these constitute the great movements in building which distinguish the opening years of the 20th century.

Slow-burning Construction.— In buildings requiring special provisions against the spread of fire, and where the artistic effect is not of prime importance, a frequent mode of construction is that known as «slow-burning» or «mill» construction. This has been brought about in a great measure through the efforts of the mutual fire-insurance companies in New England. The system consists usually in building outside walls (generally of brick) of concentrated piers or buttresses, connected by a thin curtain wall; the girders, beams and interior columns are made of large timbers and the floors of plank of a suitable thickness. It is essential to avoid concealed hollow spaces, such as furring, where dirt would accumulate. The underlying theory of slow-burning construction is that whereas small timbers, such as the three-inch joists and studs and the one-inch flooring of ordinary construction, readily burn through and are destroyed, large timbers, under the influence of severe heat, char but do not burn through readily, as the charred surface forms a non-conductor and protects the interior. If, however, for any reason they should burn to destruction, all connections are so made that the timbers can fall out of their places without disintegrating the masonry or columns on which they rest.

Beams are spaced every 8 or 10 feet between centres, and should not be painted for several years after completion of the building, in order to avoid dry-rot. The ends of timbers in masonry bear on iron plates with anchors, or rest in cast-iron boxes, with air spaces in the sides, which permit a circulation of air, and reduce the risk of dry-rot. Floor planks are not less than three inches in thickness, and for spans of 12 feet usually four inches. The larger spans are less desirable than the smaller. These planks should not be over nine inches wide. They should be planed on both sides, and grooved on the edges, the grooves being filled with hard-wood splines.

Top floors are made of 1¼-inch boards of southern pine, maple or other hard wood. It is desirable to lay top floors over a three-quarter-inch bed of mortar, or two thicknesses of heavy sheathing paper.

For rooms where there is unusual risk of fire, such as hot-air drying, it is well to protect the ceilings with plastering on metal lath, filling in solid so as to avoid any cavities. Wooden posts should be covered with asbestos paper and tin.

Roofs are best when flat, and are constructed in the same way as the floors. They should be covered with tin, gravel or duck. Where the roof is pitched, it should be covered with shingles or slate, laid over a three-quarter-inch bed of mortar.

Superposed columns are connected by iron caps, bases and pintles, arranged to give a proper bearing for the girders.

Partitions, if used, should be two-inch, tongued-and-grooved plank set on end, and plastered both sides, on metal lath.

Doors and shutters are built of two or more thicknesses of inch boards, covered on all sides with asbestos paper and tin, lock jointed.

The underwriters' associations have formulated in detail the best practice in mill construction, and are willing to advise on all questionable points.

Steel-skeleton Construction.— The closing years of the 19th century witnessed a development in the structural use of steel for buildings which is wholly without precedent. While columns and floor beams of iron or steel had been in use for many years as interior supporting members, it was not until conditions demanded buildings of extraordinary heights that the metal framework was extended to the exterior as well as the interior structure. Exterior walls constructed entirely of masonry must be made too thick for economy of space and materials if the building which they enclose is more than six or seven stories high.

The first step was made by introducing iron columns in the masonry of the outside walls, with the sole purpose of supporting the adjacent floors, the masonry of the walls carrying itself on its own independent foundations. This system was found also to lack economy after the possible height of buildings had been increased a few stories. The culmination of the system was reached when the exterior frame was designed to carry not only the floors and their various loads, but also the exterior walls. Each story now has its enclosing wall independent of the story above and below it, so that, as is frequently the case, the outer facing or curtain wall of the high building is started at several levels at the same time at intervals of 5 or 10 stories.

The limit of height construction of such buildings is not yet known. Every year or two a taller one is constructed in New York city. They have an advertising value.

Vibration and deflection under the pressure of the wind must be provided against by stiffening braces or ties in the floors or partitions, more particularly where the height of the structure is relatively great.

Where streets are narrow, the crowding together of a number of such buildings darkens the streets and often produces disagreeable and even dangerous currents of air. The trend of legislation in large cities is toward restriction of height, Boston having already fixed a limit of 125 feet from the sidewalk level to the top of the cornice line.

There are three elements which enter into the construction of the steel-skeleton building, — foundations, columns and floors. Of these three elements the column is the most important; for while foundations may settle, deranging the floor levels and causing the building to lean out of plumb; and while floors may bend or break without serious danger to any parts of the structure other than themselves,— columns, if they fail, may entail the collapse of the entire structure. For this reason, in the best work, columns are made of the softer, less brittle grades of steel, while floor beams are permitted of «medium» steel, a harder and consequently more brittle grade.

Many sections of columns have been devised, each having its own particular advantages, but columns in which all the surfaces, except those between riveted plates, are accessible, are generally to be preferred. These columns usually consist of a single web or plate, with one or more flange plates connected to the web by riveted angles. Other sections have been devised, made of Z bars or of channels connected by lattice plates, and a very ingenious column is that known as the Gray column, made up of angles in pairs connected by ties. The choice of any one form depends upon the stability of its section, the ease of procuring the parts of which it is composed and the facility of connections. It is sometimes necessary to use the box column, but it is not to be recommended by reason of the inaccessibility of the interior surfaces. Water and steam pipes are sometimes run inside the fireproofing of columns next to the steel, but this is to be avoided if possible.

Columns are usually made in two- or three-story lengths. The bearing parts are carefully ground normal to their axis, and the connections are made by riveted cover plates. The extraordinary weights which these columns are called upon to carry demand on ordinary soils a very extended footing. If this were attempted by the old method of brick or stone piers, the foundations would have to be carried to such depths that the system would not be economical. The customary method is that known as the grillage-beam system, in which the column starts from an iron or steel shoe which bears upon steel beams extending on opposite sides of the shoe, and bearing in turn upon one or more layers of beams bolted together and completely imbedded in concrete; under all is a layer of concrete whose area depends upon the compressive resistance of the soil. In rare cases the foundation is of solid rock, and the area may then be reduced to a minimum.

A peculiar type of grillage foundations is required for columns on or near party lines, beyond which the foundations may not extend. A cantilever construction is then used, whereby the wall column foundation is united by beams to the nearest interior column foundation, so that the two act together and in a measure counterbalance each other. Where foundations occupy an interior corner of a property, and must be maintained inside two intersecting party lines, it is often necessary to combine four grillages in the same fashion. Where the soil is of a very compressible nature, as is frequently the case in many parts of Chicago, the entire area of the building may have to be covered by a distributing foundation of concrete and beams, forming a pan upon which the building floats. This has been followed in some cases by settlements due to the leakage of the underlying soil, a result which might easily develop from the construction of other buildings in the immediate neighborhood. Where possible, it is preferable to penetrate through soft soils to a firm bed. In the lower part of Manhattan Island bed-rock has been reached by pneumatic caissons. These caissons are made of steel plates riveted together. The excavation is made under or in the caisson under air pressure sufficient to hold back any water-bearing material which may underlie the foundations of adjoining buildings. After the caisson has been sunk to its proper depth it is filled with concrete or such other masonry as has been designed to form the foundation. Hydraulic caissons have also been used for the same purpose. Where excavations adjoin high buildings on sandy soil, and are carried to a greater depth than the grillages, as in the case of the work on the subway in lower Broadway, New York, an artificial freezing process is sometimes resorted to. A network of tiny pipes is inserted into the sand foundation, winding in and out among each other, so as to reach every part of the foundation soil. A cold salt solution is sent through the pipes, causing the sand foundation to freeze solid. This is a very expensive process and not to be employed unless other means fail. See FOUNDATION.

The floors used in steel-skeleton construction may be of any of the ordinary fireproof types, but in designing the floors it is necessary to connect the columns by steel beams or girders, which act best for the stability of the building if arranged in continuous straight lines. The voids between the girders are spanned by beams, whose spacing is dependent upon the style of floor to be used, varying from 5 to 12 feet, the spaces between being filled by brick arches or porous terra-cotta tiles, or by concrete slabs. The amount of material in the beams must be exactly sufficient for the work — no more or less. This is essential, not only for economy, but also to reduce the dead loads on the joints, columns and foundations. There are many varieties of each of these systems, nearly all requiring the use of steel ties, plates or rods. For spans over 12 feet the monolithic concrete floor reinforced by steel bars or metal lath has been used, but there is a great tendency to deflection. The long-span systems are still in their infancy.

The girders of the exterior walls, commonly known as spandrel girders, are used at or near the level of each floor, and should be connected to the columns by knee or angle braces.

While the exterior walls of the building are carried in part on the spandrel girders, it is customary to rivet additional angles or channels on the outer face of the columns for the support of the outer four or more inches of the wall.

All projecting parts of the exterior, such as belt courses, cornices and balconies, must be supported by special framing. The ornamental finish of cornices having any great projection is often secured to the frame by iron hangers.

All parts of steel framework, except those buried in concrete, such as grillage beams, should be painted with the greatest care, as their preservation depends almost entirely on the quality of paint used and the way in which it is applied. All surfaces should be first thoroughly cleaned of scale and rust. It has been found that concrete adheres to a clean steel surface, and is a sufficient protection. All remaining parts should be given a coat of oil at the shops; they should then be painted with a coat of red lead or graphite paint upon arrival at the building, followed by a second coat after they are assembled. Sometimes a third coat is given, but it is scarcely necessary if the two previous coats have been properly applied. See CONCRETE CONSTRUCTION.

Fireproofing.— While the steel-skeleton building is economical from the constructive standpoint, its usefulness and safety are greatly impaired if it is left unprotected against the ravages of fire. Many systems of fireproofing have been devised, all of which, however, consist in enclosing the parts with a non-combustible substance,— usually a clay product, or concrete or plaster,— applied in blocks or molded forms, set in mortar. For the outside of exterior columns and girders it is considered sufficient to lay the outer facing of the wall, if of brick or terra-cotta, directly against the metal. Granite, by reason of its friability under the combined action of heat and water, should be kept sufficiently far away from the structural parts to allow of the insertion of a layer of concrete. For all other parts of the skeleton the usual protections consist of two inches of porous terra-cotta block, plaster block or cinder concrete. Columns and beams are sometimes enveloped with a sheet of wire cloth or expanded metal, and plastered.

None of these systems may be considered absolutely perfect, since they have all shown serious signs of deterioration under the continued action of a fierce fire, but it is a conceded fact that concrete, as a fire-resisting material, is unequaled.

In connection with fireproofing it is essential that interior partitions be built of non-combustible materials. Those most frequently employed are of the same nature as the fireproofing just described. Porous terra-cotta blocks and plaster blocks, three or four inches in thickness, dependent upon the height of the story in which they occur, have certain advantages by reason of the rapidity with which they can be set up, and the ease with which they can be removed where alterations are desired. Partitions are often made of small T or angle irons, over which is spread expanded metal or wire cloth in one or two thicknesses, to which the plastering is directly applied. Double thickness partitions of this sort are more soundproof than those first mentioned.

In many so-called fireproof buildings wood finishes are desired, which with the contents are a menace; but experience has shown that fire can usually be confined to the room in which it originates, and can be checked in a few minutes. Methods of fireproofing wood have been devised, and consist of injecting a fireproofing solution into the pores, either under pressure or by capillarity. Its use is not frequent, however, being largely limited to war-ships.

The most fireproof structure yet built is probably the Printing Crafts Building, adjoining the Pennsylvania Terminal, on Eighth avenue, New York city. No wood or other readily burnable material is used in the construction. The elevators are all in the centre and isolated by fireproof partitions and steel doors from the rooms. The floors and ceilings are of heavily reinforced concrete, set into steel framework. All window sashes are steel, and all glass is wired. Each tenant's quarters are separated from every other like so many ovens, so that a fire may burn out the contents of one without the least chance of communicating to another. The floors are scuppered, like those of a steamship, so that water thrown on to extinguish a blaze is led by the scuppers to the outside of the building, instead of running down the hallways and stairs. There is ample water in the standpipes to drown out any blaze that might occur, and the system ensures any fire being confined to the place of its origin. This building is also remarkable for its heavy bracing. Printing presses produce great vibration, and to overcome this heavy L braces are placed at all cross joints.

Non-Fireproof Buildings.—The great majority of buildings cannot be rated as fireproof. Construction formerly rated as fireproof is now rated as semi-fireproof. The demand for cheap structures forces the erection of a vast number of buildings of mixed brick and wood as well as all-wood or frame buildings. In New York and most large cities these non-fireproof buildings are restricted to 75 feet in height, though in a few large western cities 100 feet is permitted. Each city has its own building regulations, and these are apt to be more stringent in cities like Baltimore, San Francisco and Salem, Mass., that have suffered from severe conflagrations. In practically all United States cities wood structures of limited height are permitted outside of what are known as the «fire limits.»

Along with the advance in the construction of mercantile and public buildings in cities there has progressed a country-wide development of residence structures. These may be considered profitably under two heads: Country Homes and Suburban Homes. The former classification includes the larger and more expensive buildings erected chiefly as summer residences for men of wealth. In this class the ruling tendency has been toward the revival of the old colonial exteriors with, in many cases, reproductions of the oldtime interiors, but harmonized with the ultra-modern conveniences of the present day. Individualized examples of Elizabethan and Georgian types, with motives adapted from other foreign models have been erected; but, far outweighing this sporadic construction, has been the gradual development of a distinctly American type of country house. This may be briefly described as low and spreading, with long, peaceful horizontal lines and a low-pitched, hipped roof showing a heavy overhang. In the more successful expressions of this type much importance is given to the roof as a visible feature, treated broadly and simply. The high-pitched and lofty gables, towers, turrets and spire-like chimneys of the past have disappeared from the design, and the same fate has befallen the practice of breaking up a noble roof area with a row of petty solitary dormers. Along the Pacific Coast the architecture of the old Spanish missions has had its influence, but in general the motive has been adapted rather than adopted. This type of house combines with tall trees to produce highly artistic landscape effects which appeal strongly to that subconscious sentiment expressed by the word «homelike.» Even in the older houses of square and stocky outline the low, spreading effect has been measurably secured by the addition of one-story wings, pergolas or similar constructions.

In the smaller detached suburban homes the same idea prevails in what has been called the «bungalow»: — as it has been developed, another distinctive American creation. The essential beauty of low masses and spreading lines of the American bungalow offers a basic motive on which American architects have skilfully worked styles as widely variant as Swiss, Spanish, Italian, Old Colonial, and even Egyptian. Stucco, titles, shingles, logs, natural wood, painted sidings, upright and horizontal, in numberless combinations with stone, brick and concrete have yielded structures of striking beauty and attractiveness, and the residence quarters of many of the smaller cities show street after street of these picturesque and truly American bungalows and semi-bungalows.

Since so many materials have become available for building, there has been an immense increase in minor building supplies and conveniences. For instance, for cheap construction a plaster board is made of thin alternate layers of paper and plaster of paris, as a substitute for lath. It is simply tacked on the joists in large squares, and serves as a base to hold a thin coat of plaster. In isolated structures of the bungalow type it is a decided convenience.

Portable buildings are coming into use, these being made in sections at the factory, and shipped by rail or wagon almost anywhere. Being cheap, they are in much demand for summer camps. Some are made of corrugated steel and are quite substantial. Many are adapted for use as garages and outbuildings in the country.

Exterior Finishes.— The artistic effect of a building depends upon its color as well as upon its form either in general lines or detail. For durability and permanency of color, combined with economy, no exterior facing can surpass natural red brick. We now have reds toning into the browns and purples, and combined often with dark headers, from which it is possible to lay up a simple surface full of artistic interest. Outside the plain red, there is a wide variety of brick within certain limits; whites, buffs, browns or grays are easily obtainable both in the plain colors and mottled, and made by either the wet or the dry process. Color, width and style of mortar joints, if used knowingly, can be made to intensify or soften the natural color of the brick. American enameled brick holds its own with the English, and is invaluable for light-shafts and damp places. Nearly all makes, however, craze or chip in time.

Architectural terra-cotta, as an exterior finish, easily claims first rank in point of development. Many steel structures are covered entirely with it, excepting perhaps parts near the ground, subject to abrasion. It can be made in almost any color by means of «slips» or «glazes,» and it lends itself readily to decoration. The use of terra-cotta is of advantage to the architect, in that he can see the models for every part of the work as they are in process, and vary them to his satisfaction before they are finally cast. Economy in the use of terra-cotta comes chiefly from minimizing the number of molds; but this must be guarded against, for, if pushed to excess, monotony is likely to result.

Ornamental bronze, copper and iron work, through improved processes of manipulation, have added greatly to the possible richness of exterior effect.

Outside enclosures of sheet metal, such as iron or aluminum, are rarely æsthetic. Corrugated sheet iron has been used extensively for freight sheds, wharf enclosures and similar ordinary constructions, where no effort for good looks has been made. The enclosure of steel-skeleton buildings with metal is not to be counted upon where such buildings are tenanted, as it is too great a conductor of heat.

Rough-cast and plaster work are most admirable and sympathetic as exterior wall finishes, where the extremes of temperature from winter to summer are not too great. Even adobe structures are possible in the South and West, but their use is most limited. Rough-cast or pebble-dash is applied to both masonry walls and lath; it is more durable on masonry, as the expansion and shrinkage of lath tend to disintegrate the mortar. Rough-cast is combined frequently with timber work in imitation of the old English half-timber constructions, and is specially adapted to domestic buildings of the freer country sort.

Concrete walls, where of the right texture and color, such as that made from coquina in Florida, give a pleasing effect.

Roof coverings comprise tin, copper, slag, tiles, slate and shingles, each having its own appropriateness. Copper is the only permanent one of those mentioned, and slag is the next best. Tiles and slate require constant repairs, and shingles rarely last more than 20 years. Shingles lend themselves admirably to staining, and are deservedly popular. Thatch is attempted where picturesqueness is demanded.

A roof interesting from the constructive standpoint is that commonly used on the steel-skeleton building. It is known as actinolite, and consists of a number of thicknesses of heavy felts bedded upon a smooth Portland-cement surface, and covered with a roofing cement on which are laid vitrified tiles with the joints thoroughly filled, practically forming a pavement.

Interior Finishes.— For ordinary buildings the interior finish of floors, walls and ceilings must necessarily be simple, consisting of cement or wood for the floors and plaster for the walls and ceilings, except that in the case of mill construction walls are usually made of hard red brick, pointed inside the same as outside, and ceilings consist of the dressed undersurface of the floor planking white-washed, painted or varnished.

Cemented floors are the most permanent, particularly where they are subjected to moisture, although the hard pine and maple flooring commonly used is less tiresome to walk on and is sufficiently durable.

The so-called patent plasters have come largely into use by reason of their hardness and quick-setting quality. They are mixed by machine in fixed proportions, and are therefore more dependable in quality than the ordinary lime mortar. If applied to lath, the patent plasters require that the lath, if of wood, shall be wet before application, or, if of metal, that the metal be of heavy threads, as the finer wire cloth is sometimes eaten away by the ingredients of the plaster.

Tiles, whether of marble, ceramic or glass, form excellent interior finishes, except that small tiles for floors are likely to loosen, and frequent joints in tiling become unsightly through discoloration. The glass tile known as «opalite» produces a finish similar to enameled brick, and has been shown in some cases to be more lasting. Interlocking rubber tiles are desirable in cases where there is risk of slipping, such as for elevator floors. They are also good deadeners of sound.

Beautiful effects of mosaic, both of marble and of glass, are easily obtainable — a great variety of color and design is largely in their favor. All of these applied finishes require a solid base, preferably of masonry or concrete.

The variety of woods for interior finish is almost without limit, and has been greatly increased by staining and by methods of finish.

In no department of interior ornamentation has greater progress been made than in plaster work — a system which can be pushed to almost any point of elaboration, and which lends itself perfectly to painted decoration. In fact, there are few materials that cannot be simulated in plaster if the decoration is clever.

The field of interior decoration was never wider, and the knowledge of the application of leathers, stamped, modeled and woven fabrics, and the thousand and one other forms of wall applications, never better understood.

In marble for interior use America is not particularly fortunate. Granite and limestone produce satisfactory results, but most of the American marbles are cold and lacking in richness of texture. Among the best marbles are the Knoxville Gray, and a few of the whites. For the more beautiful effects recourse must be had to the imported marbles, such as Sienna, Numidian, Pavonnezza, Alps Green and others. See BUILDING LAWS; BUILDING MATERIALS; CITY PLANNING; IRON SKELETON CONSTRUCTION; STRENGTH OF MATERIALS.

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BUILDING AND LOAN ASSOCIATIONS, co-operative organizations, originally designed to aid their members in procuring homes, at the lowest cost, and on the easiest terms. Later developments gave them some of the functions of a bank for savings. The associations are a development, dating from 1831, when the Oxford Provident Building Association was organized in Frankford, a suburb of Philadelphia. The original associations proving successful, plans were gradually improved, until by 1850 they became an established part of American institutions. They flourished especially in the Northwest, the residential portions of Saint Paul and Minneapolis being almost entirely built up under this system. They have been operated under various titles, besides the above, as mutual loan associations, home assistance associations, co-operative savings and loan associations and co-operative banks, the latter title being popular in New England. These organizations have had exceptional development in England where single societies have founded and built up entire communities, familiar as «garden cities.»

The basic plan of these associations is the issuing of stock, which is paid for in monthly instalments, and the loaning of the money thus raised to shareholders, borrowers paying twice as much per month as lenders. It has been common to give the shares a maturing value of $200 each on which the dues are $1 per month over the entire period during which they are accumulating their par value. These shares are issued in series, at stated intervals, and each series runs its separate course in maturing. Borrowers are required to hold at least that number of shares whose par value equals the principal of their loan. In addition to their monthly dues borrowers pay a monthly instalment of interest on the loan, usually at the rate of 5 per cent per annum. When money is in brisk demand it is customary with most associations to offer the loan to the highest bidder. The amount of the premium thus bid is added to the principal of the loan, and the borrower is required to cover it with an equal value of shares on which he also pays dues as well as interest each month. The premium is thus matured at the same time as the loan. An alternate system provides that the competitive premium shall be a small additional payment each month with the dues.

Under such an arrangement an association received an average of $1.40 per month per share, and in the course of a little more than 11 years this was theoretically sufficient to bring the shares to par value. In practice, the shares would sometimes run out in 10 years, if premiums on loans ran high, and sometimes 12 or more years were required for shares to reach the $200 value, if the association had passed through hard times. When the shares reached the $200, or other maturing value, the lenders received the full par value of their shares, on which they had paid in from $120 to $144 in cash, according to circumstances, and the loans of the borrowers were canceled as paid and their mortgages satisfied. The advantage of issuing shares in series at intervals is that it enables outsiders to come in and take shares any time a new series is opened, or to purchase the most recent series, by paying the dues for the number of months such series has run.

The legislatures of the various States have made laws rendering easy the forming of these associations,. because they have proven to be a good means of enabling wage workers to build and own their own homes. The parties interested manage their own affairs, and as the money is loaned out as fast as it comes in, there is seldom any loss by peculation. To illustrate how these associations assist a man of small means to build and pay for a home, let us follow the system from his point of view. Suppose he has a lot of land, for which he has paid $400. He can subscribe for five shares of an association, of the par value of $200 each, paying therefor $5 per month. Every month, or every few months, there will be money to be loaned, and he attends the meetings, and when he thinks the premiums are low, he bids in a loan of $1,000. If the premium he bids is $100, he takes out another share and pays thereafter $6 a month in dues and $4.58 monthly in interest (assuming the rate to be 5 per cent). An appraisement committee of the association inspects the lot and the plans of the proposed house, and, if the entire loan is not above 75 per cent of the prospective value of the completed property, the loan is approved, and the borrower executes a mortgage to the association. The money thus loaned for the building of a house does not pass into the hands of the borrower, but is paid directly by the association to the builder as his work progresses. The association will not have to pay over any of the loan until the house is half completed, and then only half of the loan (and perhaps 10 per cent less, if the contract is so drawn), and the remainder when the house is finished, after some months. In the meantime the borrower is paying interest upon the whole loan, and also upon the premium which he did not receive at all. It is by these small side profits that the shares of these associations are more quickly matured, and in this early maturing the borrowing member shares equally with the lending member, the home being paid for that much sooner. In the case cited, the loan of $1,100 would be canceled with the maturing of the shares, and as the value of the six shares would be $1,200, the borrower would receive $100 in cash in addition.

Many of the associations issue two kinds of shares: the regular instalment shares and the full-paid or saving shares. The latter are not accounted as membership shares. Their owners have no vote in the conduct of the association, and interest is paid at a fixed rate, generally working out at an average of 20 per cent less than the profits of the regular shareholder.

Since 1912 several of the States have passed «Rural Credits» laws, authorizing Building and Loan associations in such States to make long-time (up to 20 years) loans to farmers on mortgage notes based on farm property. These «rural credit» shares are figured to pay 5 per cent clear to the lending members, and are charged to the farmer at about 6½ per cent interest.

The plan appeals to the wage worker, because of the easy payments. It appeals to small lenders, because it affords them a sort of savings bank and encourages systematic savings. Small tradesmen and merchants are almost as apt to become interested in such associations as are those who work for a weekly wage, and the economical methods by which a large amount of money is borrowed and loaned safely have attracted many to the associations as being a safe depository, and likely to pay 6 or even 7 per cent dividends.

Originally, these associations were usually confined to a town or locality, no loans being made beyond the territory where most of the members lived and knew the value of the property. But within recent years both State and national associations have been organized, which do business anywhere within the limits of their larger territory. It is a significant fact, however, that many of these larger associations have come to grief, and at their best their profits have been much smaller than those of the local associations, their expenses being very much larger proportionally for the sums handled.

The management of an association is usually lodged in a board of directors elected annually from the shareholders, and whose members serve without pay. They pass upon the loans, and having investments of their own to protect, closely guard the association treasury. The secretary is customarily the only salaried officer, and is often paid for doing the detail work by a system of small fees. Sometimes the fines levied on delinquents are his sole compensation.

Each association makes minor laws of its own, and many vary the plan as above given in numerous details; but the general principles here outlined are the same with all.

In 1916 there were in the United States, as reported at the annual meeting of the League of Building and Loan Associations, 6,806 of the local associations, most of them being in Pennsylvania, where they number 1,820; New Jersey following in order with 742, and Ohio with 657. The total membership reported was 3,334,899, an increase in the year of 230,964. Among the States Ohio was credited with having the largest list of members, numbering 649,126. The aggregate assets of all the associations was $1,484,295,875, an increase in the year of $126,497,975, and an average of $445.05 per member. In the ten years (since 1906) the membership had nearly doubled and the assets more than doubled. The aggregate expense of management for all the associations for the year was $8,640,152, a little less than nine-tenths of 1 per cent of the year's receipts. See CO-OPERATIVE BANKING; LAND CREDITS.

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BUILDING LAWS, laws passed either by State or municipal authorities regulating the construction of buildings by landowners or lessees on their lands. Usually they prescribe the height of buildings, their distance from the street, the composition, dimensions, strength, etc., of the materials used, the manner of lighting, ventilating and drainage, the amount of open space around them, and the measures to be adopted to make structures sanitary and as far as possible free from the perils of fire.

Colonial Regulations.— Early in American history laws were passed with the object of preventing disastrous conflagrations and with a view to making the towns and villages more substantial and architecturally more beautiful. In 1662 the Virginia legislature passed an act for the building of a town at James City, which act provided: «That the towne to be built shall consist of 32 houses, each house to be built with brick, 40 foot long, 20 foot wide, within the walls, to be 18 foote high above the ground, the walls to be two brick thick to the water table, and a brick and a halfe thick above the water table to the roofe, the roofe to be 15 foote pitch and to be covered with slate or tile»; furthermore that «noe wooden houses shall hereafter be built within the limits of the towne, nor those now standing be hereafter repaired, but brick ones to be erected in theire steads» (Hening, W. W., ‘Statutes at Large of Virginia,’ (Vol. II, pp. 172–76, New York 1823). On 23 Jan. 1648 an ordinance was passed at New Amsterdam providing that «henceforth no wooden or merely plastered chimneys shall be put into any house between the Fort and the Fresh Water,» because «some careless people neglect to have their chimneys properly swept and they do not take care of their fires.» On 15 Dec. 1657 the New Netherland council directed that «all roofs covered with reeds, all wooden chimneys, all hay ricks shall be taken down and removed within the next four months» and that «fire buckets, ladders and hooks be kept at the corners of the city streets and in public houses.» (Fernow, Berthold (ed.), ‘The Records of New Amsterdam,’ Vol. I, pp. 5, 34–35, New York 1897). In 1761 an act was passed «for the more effectual prevention of fires and for the regulating of buildings in the City of New York,» providing that «every building that shall be erected after January 1, 1766 in the city south of ‘Fresh Water’ shall be made of stone or brick and roofed with tile or slate.» (‘Colonial Laws of New York,’ Vol. I, p. 269; Vol. IV, p. 571, New York 1896). As many years elapsed before the inauguration of buildings several stories in height, the early building legislation was concerned with one- or two-story houses.

Fire Prevention Measures.— The numerous appalling disasters that culminated in the Chicago fire of 1871 led to the establishment in many cities of what is known as «fire limits,» within which none was allowed to erect enclosing walls and roofs of inflammable material. With the expansion of the area of the city the fire limits were extended but the Baltimore fire of 1909 showed that this extension had not been pushed either sufficiently far or rapidly. Many suggestions have been made to overcome the danger, such as dividing the larger cities into three fire-zones, the innermost zone containing fireproof buildings only; the next zone only such buildings as have non-inflammable walls; and the third area buildings which may be constructed with inflammable exterior walls but with non-inflammable roofs and other protective features. Where rows of wooden houses prevail, as in suburban communities, a «fire wall street» has been suggested, though as yet not incorporated in any law. By this is meant the erection of non-inflammable buildings on certain streets, which would traverse dangerous areas at right angles, thus cutting a district into isolated sections.

About 1886, owing to the great loss of life in theatre fires at Brooklyn and Vienna, special types of construction and protection were adopted for buildings devoted to large assemblages of people. The New England mutual insurance companies have advocated a better type of factory construction and have imposed prohibitive insurance rates on buildings that do not meet proper standards, while the National Board of Fire Underwriters has used every effort to secure the adoption of better fire resisting devices, such as automatic sprinklers. The opposition of private interests had to be overcome in securing protective legislation, since manufacturers endeavored to have their materials specified in the building laws to the exclusion of all others. Thus in 1888–90 the makers of structural steel products met strenuous opposition from the iron founders who believed that their control of structural iron work would be taken from them. See FIRE PROTECTION; FIREPROOFING AND FIREPROOF CONSTRUCTION.

State Codes.— As a rule the regulation of building construction has been left to the local communities, but the growth of small towns and cities into large metropolitan districts has brought about in some States the realization that local ordinances must be based on State-wide laws. In 1911 Ohio adopted a State building code, and codes were subsequently prepared for Pennsylvania and Illinois. Many movements have been instituted to secure special State legislation to improve poorer class dwellings, such as prevail in some districts of New York, Saint Louis and other large cities, under the belief that local ordinances could not be enforced against small property owners so as to obtain the necessary and desirable reforms. Accordingly tenement house laws (State laws instead of local ordinances) have been adopted, which in many cases have necessitated the razing of certain types of old houses because they could not be changed in any way that would ensure the required air space and other sanitary provisions. The constitutionality of these so-called confiscatory measures or legislative interferences with property rights has been upheld as within the police powers of the State. See TENEMENT-HOUSE.

The High Factory Building.— In recent years legislation has been concerned with the growing problem of the factory located in large cities. One reason for the establishment of factories in such places is that the manufacture of «seasonal» goods demands the proximity of a large supply of surplus labor and this advantage is given by a congested city area. The average height of such factories is 10 stories and in many of them conditions prevail worse than those of the so-called sweatshops or tenement-house factories. The problem has been studied by a State factory investigation committee and a local «commission on congestion of population» and it seems likely that the control of such buildings can be made absolute only by enlarging the powers of the State or municipal departments having under their charge all measures for health, fire prevention and safe construction. See FACTORIES AND FACTORY INSPECTION.

Recent Enactments.— Much effective work has been done by the National Board of Fire Underwriters and the National Fire Protection Association, working in conjunction with State and local authorities, and the American Institute of Architects, in securing good building codes and improved methods of construction, not entirely by process of law but also by educating the various communities to the economic value of the high standards set. This has been done chiefly by reducing insurance rates and demonstrating the possibilities of lower cost of maintenance and repairs.

In 1915 New York city adopted a new code that had been under preparation for several years by Rudolph P. Miller, formerly superintendent of the Manhattan building department, assisted by a committee of fire underwriters, architects, builders, structural engineers and representatives of the real estate interests. There were a number of important new sections as well as changes, the idea being to establish a foundation for future building construction and inspection and to provide a code that would ensure the highest type of construction, sanitation and fire protection. A change in the fireproof limits was made; provisions were adopted for reinforced concrete and terra-cotta construction, for greater use of hollow tile, for increased exit facilities, for projections beyond the building lines, for providing flues and chimneys in a building where the abutting building is built higher, for inspecting and certifying elevator installation, etc.; new specifications for ventilation and lighting were adopted; provision was made for an assessment of penalties and for compelling immediate compliance with departmental orders. In Philadelphia new regulations were enacted in 1915 relating to the construction of reinforced concrete buildings requiring that, when plans of such a building were submitted to the building department, stress computations and detailed descriptions should accompany them, including the nature and sizes of all reinforcements, the quality, proportions and method of the concrete, and the dead and live loads that each and every floor was supposed to carry. In 1916, after three years' investigation at home and abroad, the New York City Board of Estimate and Apportionment, under authorization by the State legislature, divided the city into four classifications: (1) residence; (2) business; (3) unrestricted; (4) undetermined. In the first, all kinds of business and industrial buildings and occupations are excluded. In the second, residences are permitted, but industrial buildings are prohibited, and only certain limited areas are permitted for industrial occupations. The unrestricted districts are open to industrial uses, and it is expected that they will congregate there. The classification «undetermined» is given to areas in which the particular lines of development are not yet evident, owing to the incomplete state of the city's transportation facilities. By the same act a schedule of heights for buildings was established upon which the basis of the width of the streets on which they are built. In 1917 the legislatures of seven States — Pennsylvania, New Jersey, California, Minnesota, Michigan, Rhole Island and Indiana — passed laws affecting buildings throughout those States, the so-called «zoning» system as applied to New York exhibiting a marked influence.

In 1915 the 'Fourth Edition of the Building Code' was published by the National Board of Fire Underwriters of New York. This gives a vast amount of information regarding building problems, methods and requirements of construction and materials, and the most noteworthy features that have been incorporated in local codes. It also gives the most advanced requirements in fire protection, considers the question of materials and working stresses and gives the latest developments for iron, steel, timber, etc., based on official and other tests. The Federal government has taken interest in the standardization of building methods to the extent of issuing an order through the Treasury Department that uniformity and business economy must be established in the construction of post offices and other government buildings. Consult Ash, M., 'Building Code of New York City' (New York 1899); Blake, Clinton H., 'The Law of Architecture and Buildings' (New York 1916); Fitzpatrick, F. W., 'Building Code, a Compilation of Building Regulations' (Chicago 1913); Hoxie, G. L., 'City Taxation and Skyscraper Control' (in *Journal of Political Economy*, Vol. XXIII, pp. 166–76, Chicago, February 1915); Ray, David H., 'Architecture, Engineering and the Building Law' (New York 1911); Williams, F. B., 'City-planning Restrictions on Private Property' (in *The American City*, Vol. XIII, pp. 24–30, New York, July 1915); National Board of Fire Underwriters, 'Building Code Recommendation' (4th ed., New York 1915); Factory Mutual Companies, 'Publications'; National Fire Protective Association, 'Publications'; Brooklyn *Daily Eagle*, 'Building and Health Laws and Regulations Affecting the City of New York' (1912); and the various yearbooks.

RICHARD FERRIS,
Editorial Staff of The Americana.

BUILDING LEASE, a lease of land for a long term of years, usually 99 years, at a rent called a ground-rent, the lessee covenanting to erect certain edifices thereon, and to maintain the same during the term. At the expiration of the lease the houses built become the absolute property of the landlord, unless otherwise provided in the contract. See LEASE.

BUILDING MATERIALS. The materials used for structural engineering and architectural purposes may be conveniently divided into two general classes — «materials of construction,» such as the woods, stone, metals, cements, etc., and «materials of consumption,» such as coal, water, oil, etc., which are consumed or transformed while being used.

In this article, the materials of construction will be briefly considered according to their physical and chemical properties, and their adaptability for various purposes, leaving the consideration of the materials of consumption to the sphere of chemistry and physics where they properly belong.

Apart from their chemical composition, the principal properties of building materials important to the engineer are the «density» or specific gravity of the substance; its «resistance» or capacity to withstand strains and stresses; the «hardness» or power to oppose penetration; its «toughness» or capacity to elongate under tension without rupturing; its «brittleness,» which is the opposite of toughness; and its behavior under conditions of varying temperature, or when worked in the many ways required by structural operations.

Timber or Wood.— The following general facts relative to the physical properties of wood have been determined by experiment: (1) Bleeding has not much effect on the strength of wood, but increases its flexibility slightly, and it is probable that bled timber will stand exposure to the weather fully as well as the unbled. (2) In general, moisture absorbed in the form of sap, or in the form of water after seasoning, reduces the strength of wood. Well-seasoned wood or that which contains not more than 12 per cent of moisture is from 75 to 100 per cent stronger than green timber. (3) In artificially-dried timber any remaining moisture exists in a uniform percentage throughout the mass, a condition which requires months, and sometimes years, to attain in heavy air-dried timber. (4) The strength per square inch of section of large timbers is in every way equal to that of small timbers, provided they are equally sound and contain the same percentage of moisture. (5) In general, the strength of woods of uniform structure increases with their specific gravity, that is, the heavier wood is generally the stronger. Oak, however, appears to be an exception to this rule. (6) Seasoned wood will increase in weight to the extent of 5 to 15 per cent if exposed to the weather. This excess of weight can be easily reduced by keeping the timber in a warm dry place for a week or 10 days.

In Table 1 below is given the physical properties of some of the woods suitable for structural, interior finishing, decorative and other similar purposes. The «elastic limit» given in the table is a relative quantity, as there is no definite «elastic limit» in woods similar to that in metals. In Table 2, the strengths of green woods of various kinds under different stresses. When well dried their strength is increased from 50 to 75 per cent. It is considered that only when wood is green can a test be accurately made, as it is quite impossible to gauge the exact degree of moisture remaining in seasoned wood.

In selecting and preparing timber or wood

TABLE 1— PHYSICAL PROPERTIES OF TIMBER OR WOOD

(As determined by tests of seasoned timber, containing 12 per cent or less of moisture)

The stresses are given in pounds per square inch

Name of Wood	Ultimate Resistance to —						Modulus of —			Ordinary Working Stress			Weight per cubic foot (pounds)
	Tension	Compression (length)	Compression (cross)	Shearing (length)	Shearing (cross)	Elastic limit	Elasticity	Ultimate bending	Elastic bending	Tension	Compression	Transverse	
Ash (American)	17,000	7,200	1,900	1,100	6,820	7,900	1,640,000	10,800	7,900	2,000	1,000	1,200	39
Birch	15,000	8,000	......	......	5,600	......	1,645,000	11,700	......	2,000	1,000	1,200	33
Cedar (American red)	10,600	6,000	600	400	1,300	5,600	900,000	7,000	5,600	1,300	700	900	24
Chestnut	11,500	5,300	......	......	1,500	......	1,130,000	8,000	......	1,400	600	900	41
Fir	13,000	......	......	1,300	......	......	1,500,000	......	......	......	......	......	......
Gum	......	7,000	1,400	800	5,800	7,800	1,700,000	9,600	7,600	1,200	900	900	37
Hemlock	8,700	5,700	......	400	2,700	......	....	7,000	......	......	......	750	25
Hickory (American aver.)	19,500	9,500	2,500	1,000	6,200	11,200	2,400,000	17,000	12,000	2,000	1,200	1,800	50
Lignum-vitæ	11,800	9,800	......	......	......	......	....	11,000	......	1,500	1,200	1,500	83
Maple	11,000	7,000	1,800	500	6,000	......	....	10,000	......	......	......	......	49
Oregon pine	13,000	5,700	800	500	......	6,400	1,600,000	7,800	6,400	1,400	700	1,000	32
Oak (black)	10,000	7,300	1,900	1,100	......	8,100	1,740,000	10,800	8,100	1,400	900	1,200	45
Oak (white)	13,600	8,500	2,200	1,000	4,400	9,600	2,090,000	13,000	9,600	1,700	1,000	1,500	50
Pine (Southern yellow)	13,000	8,000	1,200	835	5,600	10,000	2,070,000	12,600	9,500	1,600	1,000	1,500	38
Pine (Cuban)	13,000	8,700	1,200	770	5,000	11,000	2,300,000	13,600	10,600	......	......	......	......
Pine (loblolly)	13,000	7,400	1,150	800	......	9,200	2,050,000	11,300	9,400	1,600	900	1,200	33
Pine (white)	10,000	5,400	700	400	2,500	6,400	1,390,000	7,900	6,400	1,200	700	900	24
Poplar	7,000	5,000	......	......	......	......	....	6,500	......	900	600	750	......
Spruce (Northern)	11,000	6,000	800	400	3,250	......	1,400,000	8,000	......	1,200	700	900	26
Spruce (Southern)	1,200	7,300	1,200	800	......	8,400	1,640,000	10,000	8,400	1,200	700	900	30
Walnut (black)	10,500	7,500	2,500	......	4,700	5,700	1,306,000	8,000	......	1,000	1,000	900	38

Table 2.—Strength of Green Woods

Compiled from United States Forest Service Circular 213 (Washington 1913)

Figures show pounds per square inch

Name of Wood	Fibre stress at elastic limit	Modulus of rupture	Modulus of elasticity	Crushing parallel to grain	Crushing perpendicular to grain	Crushing elasticity parallel to grain	Shearing strength; parallel to grain	Tension perpendicular to grain; minimum
Ash (white)	5,180	9,920	1,416,000	4,220	889	3,510	1,300	645
Birch (yellow)	4,190	8,390	1,597,000	3,400	439	2,570	1,150	446
Cedar (Arkansas)	3,950	6,040	754,000	3,030	518	2,710	613	....
Cypress	4,430	7,110	1,378,000	3,960	548	3,560	836	242
Fir (Douglas)	3,570	6,350	1,247,000	2,920	427	2,390	853	304
Gum (red)	3,460	6,450	1,138,000	2,690	....	....	....	....
Hemlock	3,410	5,770	917,000	2,750	420	2,110	790	271
Hickory (average)	5,470	10,280	1,399,000	4,370	1,080	3,730	1,094	....
Maple (red)	4,450	8,310	1,445,000	3,560	606	....	1,130	610
Oak (red)	3,890	8,100	1,248,000	3,440	844	2,540	1,215	660
Oak (white)	4,320	8,090	1,137,000	3,520	829	2,400	1,096	622
Pine (longleaf)	5,090	8,630	1,662,000	4,280	491	3,420	1,060	240
Pine (white)	3,410	5,310	1,073,000	2,720	314	2,370	649	225
Redwood	4,530	6,560	1,024,000	3,820	530	3,420	....	....
Spruce (red)	3,440	5,820	1,143,000	2,920	322	....	754	....
Tamarack	4,200	7,170	1,236,000	3,480	480	3,010	883	236

for structural purposes, a careful consideration of the following facts in addition to those already stated is quite important: (1) That timber grown in moist soils is lighter, and decays more quickly than that grown in dry, sandy soil, and that, usually, the best timber is that grown in a dark soil intermixed with gravel, with the exception of those various kinds, such as poplar, cypress, willow and all others that naturally grow best in a wet soil. (2) That the wood of trees grown upon the plains or in the centre of forests is less dense than that of those grown upon the edge of a forest or upon the side of a hill. (3) That in temperate latitudes, as in the United States, standing timber should be selected in the latter part of July or the first part of August, when the sound and healthy trees are indicated by fresh green leaves, in contrast to the unsound and unhealthy trees, the leaves of which begin to turn yellow at that season of the year. Decaying branches, a scarcity of leaves and the tendency of the bark to become rough and to separate from the wood, are positive indications that the physical properties of the wood are impaired.

The trees selected should be those that have most nearly attained their full maturity, a period which varies greatly with the different species. As a rule, the age and the rate of growth of a tree may be ascertained from the number and the width of the rings of annual increase which are exhibited in a cross-section of the wood. (4) That timber should be felled or cut either in midsummer or in midwinter. In midsummer, the most suitable time is in the month of July. A tree should be cut as near to the ground as possible, as the lower part of the trunk furnishes the best timber. (5) That as soon as a tree is felled it should be «dressed» by having its bark stripped off, then raised from the ground and the sap-wood removed, and finally squared or reduced to the required dimensions. (6) That in the inspection of timber the quality of the wood may be ascertained by observing that its color, as exhibited by a cross-section, is practically uniform in the heart. It may be a little deeper in color at the centre than near the white-colored sap-wood next to the bark, but the gradation should be uniform and free from sudden transitions of color, or white spots, which are infallible signs of decay; that it is free from «wind-shakes» or circular cracks which separate the concentric layers of wood from each other, and constitute a very serious defect; that it is free from «splits,» «checks» and «cracks,» which extend very deeply toward the centre; and that it is free from large or decayed knots, which tend to materially affect its strength.

Furthermore, the condition known as «brash-wood» is generally consequent to the decay of the tree on account of age, and is characterized by a reddish color of the wood which becomes porous, and breaks off short without splintering; while «belted» timber is that which has been killed, or which has died from some unavoidable cause, before being felled, and is of a highly objectionable character. Other serious defects are indicated by the presence of many knots, which, although the timber may be sound, stamps it as being of stunted growth, and is commonly known as «knotty timber,» and a spirally winding grain characteristic of «twisted wood» which is unfit for long pieces. Dry-rot is indicated by yellow stains; elm and beech are very quickly affected by it if left with the bark on after felling.

The proper seasoning and preserving of timber is of the utmost importance in connection with its use as a material of construction. Freshly cut timber contains from 35 to 50 per cent of moisture, which may be reduced to 17 or 25 per cent, by exposure to the air in seasoning one year, and to less than 12 per cent, by artificial drying in a comparatively short time.

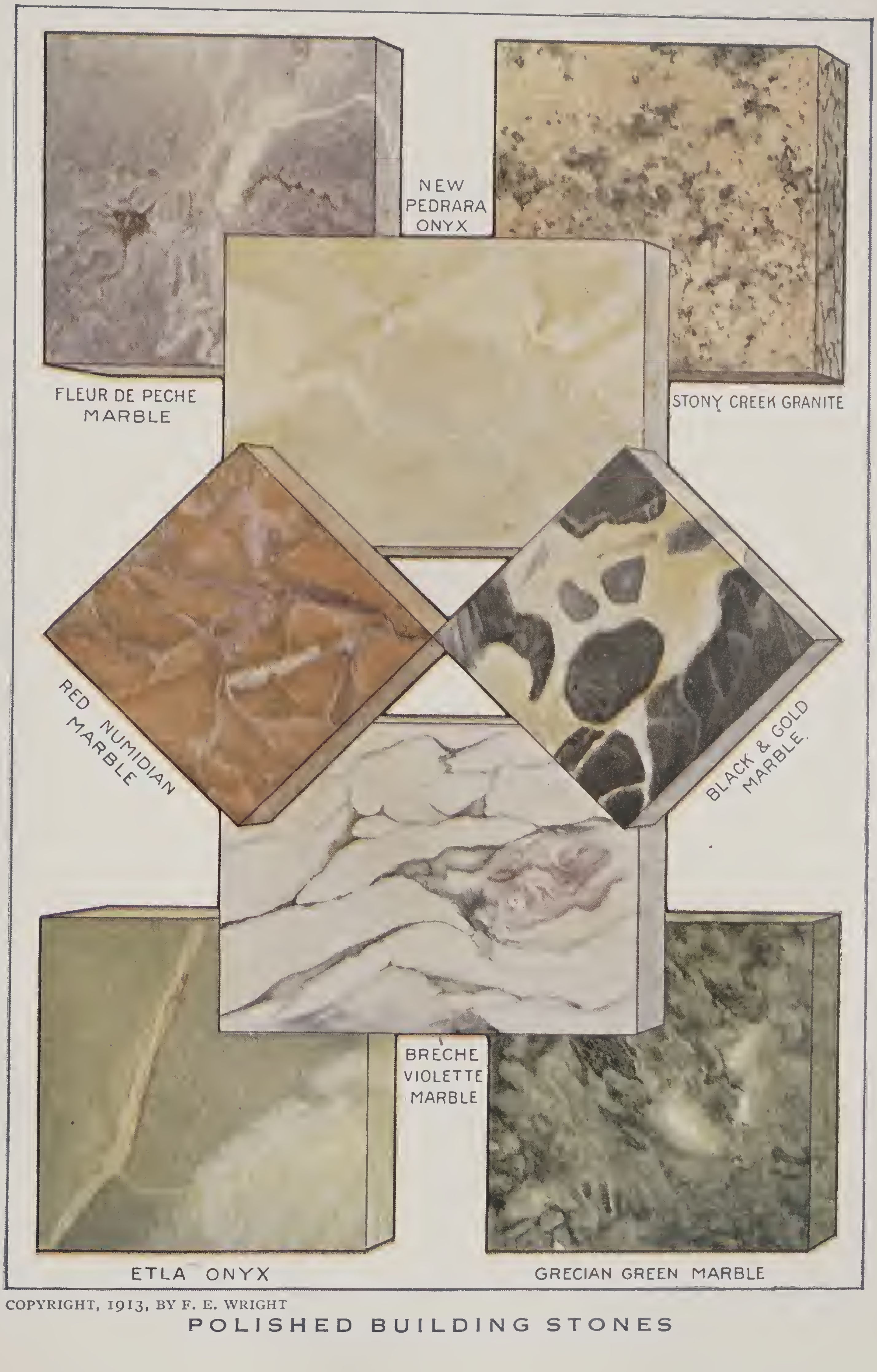
There are various processes of seasoning. Natural seasoning requires a period ranging from two to eight years, according to the size and physical properties of the wood. Timber of large dimensions is not only improved in strength, but is rendered less liable to warp and crack in becoming seasoned, by being previously immersed in water for several weeks. When the seasoning is accomplished naturally by exposure to the air, the timber should be piled under a shed and kept dry, with a free circulation of air about it, but without exposure to strong currents. The bottom pieces should be placed upon skids raised about two feet from the ground, and a space of at least an inch should be allowed between the horizontal layers. Slats or piling strips should be placed between the layers at each end of the pile, and also at short intervals between the ends so as to prevent the timber from «winding.» It is important that these strips should be placed directly one over the other and that they should not be less than one inch in thickness. Care should be taken to pile the heavy timbers upon the ground floor of the shelter, and the light stuff upon the upper portion, with a clearance of at least two and one-half feet between the piles. The timber should be repiled from time to time, and all pieces showing any indications of decay should be removed, so as to prevent their affecting that which is sound and healthy. The gradual method of seasoning is undoubtedly the most suitable for preserving the strength and durability of the timber; but, as already stated in the preceding paragraphs, it has been very definitely ascertained by tests that the results of artificial methods, properly applied, do not indicate that those qualities are materially affected by such processes, while other important advantages, such as the reduction in the time required for seasoning, and the uniformity of the percentage of moisture contained in the seasoned product, are unquestionably obtained. The hastening of seasoning by steaming the timber has been successfully accomplished, and the saturation of timber with a solution of corrosive sublimate, to secure it against dry-rot, and to protect it from the attacks of worms, has proved very satisfactory. Kiln-drying, however, is applicable only for boards and other pieces of small dimensions, and has a tendency to crack the wood and impair the strength in various ways, unless it is accomplished very slowly. Timber ought not to be seasoned by either charring or smoking, and should not be painted unless it has been thoroughly seasoned, as such methods and applications effectually prevent the drying of the wood in the interior of the piece, so that fermentation sets in and decay soon takes place.

The principal processes of impregnation are the following: «Kyanizing,» introduced by Kyan in 1832, consists in saturating the wood with a solution containing one pound of chloride of mercury to four gallons of water under a pressure of 15 pounds per square inch; «Burnettizing,» introduced by Burnett in 1838, by which the wood is first submitted to live steam at a pressure of 20 pounds for several hours; then exhausted by vacuum pumps for a few hours; then impregnated in vacuo with a solution of one pound of zinc chloride to 10 gallons of water, at 160° F., and finally treated to air pressure at 150 pounds per square inch; «Creosoting,» introduced by Bethel, by which the wood is impregnated with the oil of creosote mixed with bituminous matter under an endwise pressure of 150 to 400 pounds per square inch. The Kyanizing and the Boucheri processes are applied to standing timber, that is, while the tree is still growing, the head is cut off and the top of the stem is hollowed into the form of a bowl and filled with the impregnating solution which, being replenished from time to time, soaks down into the tree, killing it as it goes down, but thoroughly saturating the wood and imparting to it a remarkable degree of durability. Timber may be creosoted by simply steeping it in the oil of creosote, but the «creosoting» and «burnettizing» of timber of large dimensions is accomplished with the aid of special apparatus that gives the requisite pressures. Creosoting is the most satisfactory method of preserving timber used as piles for wharves against the attacks of the «Teredo» or ship-worm, but it is not an infallible remedy.

The presence of vegetable albumen in timber appears to be the primary cause for its deterioration. The most necessary element in the healthy growing tree, it is the most pernicious of all in that which is dead. The sapwood contains a large proportion of it and other fermentable elements, the putrefactions of which cause dry-rot or sap-rot, and produce various forms of injurious fungi, therefore, in order to correct these evils, the most effective method to preserve timber is to expel or exhaust its fluids, solidify its albumen and introduce an antiseptic liquid. This appears to be accomplished in the most satisfactory manner by the process introduced by Robbins in 1865, by which the liquids are dissipated and the albumen solidified by heating the wood in a chamber raised to a temperature of 212° F., and then subjecting it to the vapor of coal-tar, resin or bituminous oils, which, being at a temperature of not less than 325° F., will readily take the place of the vapor expelled by the lower temperature.

Stone.— To be suitable for building purposes, it is essential that a stone should possess the qualities of durability, permanency of color, strength and toughness, and should be susceptible of being inexpensively quarried, and easily worked. The greater number of such stones belongs to some one of the following classes of rocks: (1) The crystalline; (2) the calcareous; and (3) the fragmental rocks, including the sandstones and slates.

Of the crystalline rocks, the best known and the most suitable are the granites and the syenites, which possess an average crushing strength of from 15,000 to 26,200 pounds per square inch; most of them above 20,000 pounds. These stones, varying greatly in their physical composition and color, are found in large quantities in all parts of the world. They are very proof against the action of frost, and are commonly quite permanent in color, varying from a sparkling whitish gray to dark gray, and from a delicate pink to a dark red. Until recently, on account of great hardness, granite was only employed for massive masonry in which roughly dressed stones could be appropriately used, or where the magnitude of the structures permitted the great expense involved in dressing and polishing; but the development of improved forms of stone-cutting and dressing machinery during the last few years permits of its being turned and carved into columns, pilasters and other forms, and polished perfectly, at a comparatively small expense, so that it is being used more and more extensively, and is be-



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POLISHED BUILDING STONES

coming one of the most popular of all building stones.

Although quarried in practically every Eastern State embracing the Appalachian Mountain system, from Maine to North Carolina, and in the States of California, Montana, Wyoming, Colorado, Minnesota, Wisconsin and Missouri, the greatest supply of granite in the United States is furnished by Maine and Massachusetts. The Maine granites, principally derived from the Hurricane Island quarries, are mostly of the light gray variety, although a limited amount of the pink and red varieties are also quarried and are found to be commercially available. The Massachusetts granites are of a rich dark blue-gray color, and are extensively quarried in the vicinity of Quincy, while other fine granites of similar qualities are quarried at Concord, N. H., and Westerly, R. I.

While the United States is one of the largest producers of granite, it is also one of its largest importers. Red granites from the quarries at Peterhead, Scotland, and the gray granites from Aberdeen are quite largely brought into this country for monumental work. They take a very high polish, and are of great durability, especially the coarse red variety. This is also the case with the red and gray Canadian granites, which are extensively quarried in Quebec, New Brunswick, Nova Scotia, Ontario, and near Victoria, in British Columbia. In the United States, besides granite and syenite, the other crystalline rocks available to some extent for building purposes are porphyry, gneiss and trap. Porphyry, although a very handsome building stone, with large crystalline structure, and colors ranging through shades of white, gray, pink, red and black, is used only to a limited extent in rough construction on account of its great hardness, and the consequent difficulty of cutting and polishing it within a reasonable limit of expense. Gneiss is more extensively used; it resembles granite in composition, but, unlike granite, it has a well-defined cleavage, which allows it to be split into thick slabs. Trap is a sombre-hued rock, which is very difficult to work, and is seldom used as a material of construction, except in the form of paving blocks, or as crushed stone for making concrete or road material.

Of the calcareous rocks, the most suitable for structural purposes are the limestones and the marbles. These consist of carbonate of lime, and differ in quality rather than in composition, the marble having a crystalline structure capable of taking a high polish. The oolitic limestones, possessing great strength, their resistance to compression ranging from 4,500 pounds up to 20,600 pounds per square inch (the strongest being those from Arkansas and Vermont), are in great favor because of their fine and even texture. The most widely known in the United States are those quarried in Indiana and Kentucky, from strata of Mississippian (Sub-Carboniferous Age), and commonly known as «Bedford Stone»; they are handsome in color and are very easily worked. The colors of limestones range through broken shades of pink, red, yellow, green and blue, imparted to the structure by various impurities. Dolomitic limestone, commonly known as dolomite, contains magnesia in addition to the carbonate of lime; is somewhat coarse in quality, and is quarried in nearly every State of the Union, to supply an apparently permanent local demand. The most favorably known of the foreign varieties is that obtained from the quarries of the Isle of Portland, England, and the French stones quarried near Caen, Normandy. The latter is a soft, fine-grained stone of a light color very suitable for carved work, but entirely unfitted for exposed structures in cold climates, on account of its highly absorbent quality.

The marbles are generally harder than the limestones, having a crushing strength of from 10,300 to 16,000 pounds per square inch. They are the most showy and ornamental of all building stones, and have been very popular since the earliest times. A great many beautiful varieties are quarried in various parts of the United States, but about 60 per cent of the total amount is quarried in the State of Vermont, the principal centres of the industry being Dorset, West Rutland, Middlebury, Wallingford, Brandon and Pittsford. These marbles are of all varieties of texture, and range in color from pure white to dark green, and dark blue, the white stones often being veined and mottled with the darker colors. Very beautiful marbles are also quarried in Tennessee. They are particularly noticeable on account of their variegated colors, which include many shades of chocolate and red, and lemon yellow, olive and green, which form an endless variety of color combinations of striking effect. The distribution of these Appalachian marbles extends from Vermont to Georgia, and they are extensively quarried in all of the States bordering that mountain system. On the other hand, although very fine marble deposits exist in many of the States in the Rocky Mountain region, they have not been worked to any great extent, up to the present time, on account of lack of transportation, and the limited local demand.

The most notable of the foreign marbles are those of Italy, the French Pyrenees and Belgium, although Germany, Austria, Spain, Portugal and Ireland also furnish many varieties of fine texture and color. Among the most beautiful of these European productions are the «Brocatelle» marbles, having a light yellow body marked with veins and blotches of dull red, and the Languedoc, having a brilliant scarlet body color blotched with white, both of which are obtained from the Pyrenees; the «Black and Gold,» a black limestone veined with yellow; the pure white stone of Carrara, and the «Giallo Antico,» a yellow marble, all three of which are obtained from Italy; and the Saint Anne marble having a deep blue-black body color marked with white veins, and the pure black marble known as «Belgian Black,» which is obtained from Belgium.

Of the fragmental rocks, a great variety of sandstones are used for facing, lintels and general structural purposes, while slate is used for roofing, and for floor tiles, flagging and mantels. Sandstones are composed of rounded and angular grains of sand, bound together by such cementing materials as silica, oxide of iron and carbonate of lime, into the form of solid rocks. The presence of silica gives a white colored stone of durable quality, but very difficult to work. Cementation by oxide of iron gives a reddish or brownish stone of medium durability, fairly easy to work. Carbonate of lime cement gives a gray-colored stone much softer than the other two varieties, and much easier to work, but much less durable. Sandstones vary in texture from those having a very fine grain to those composed of pebbles. The latter are divided into two classes — the «conglomerates» composed of rounded pebbles, and «breccias» composed of angular pebbles. Some sandstones have a clayey cement which makes them unfit for building purposes, while others, although they contain hardly any cement, and owe their tenacity to the pressure under which they were consolidated, make good building stone. As a general rule, sandstones are softer when first quarried than after a period of seasoning by exposure to the air. They vary in color from light gray, buff, drab and blue, through shades of brown, pink and red. Their resistance to compression ranges from 7,000 pounds per square inch for the Oregon stone to 16,000 pounds for the Connecticut sandstone; while the «Medina» stone and the bluestone of New York have a crushing strength of 14,000 pounds per square inch. Other well-known and extensively quarried varieties are the «Berea» stone of Ohio, and the «Portland» stone of Massachusetts and Connecticut. The Lake Superior «Red Sandstone» of Keweenawan Age, and the «Brownstone» of the Connecticut Valley and New Jersey, of Triassic Age, were formerly very popular but are now in much less demand.

Slate consists of an indurated clay which may be easily split into sheets of various sizes and considerable thinness. The principal quarries in this country are located in Maine, Vermont, Pennsylvania and New York, while those of Ardennes in France, and of Wales in England, are the greatest producers in Europe. Slate is used most extensively as a roofing material.

The methods employed in quarrying building-stone vary with the character of the stone, but the ultimate object of all of them is to obtain large and well-shaped blocks free from incipient fractures. Therefore, explosives are used as little as possible for that purpose, and the work of dressing is very largely done by hand. A great deal of machinery, however, is employed for the purposes of sawing, planing and polishing, and for splitting slate.

The durability of a building stone is one of the most important factors in its value as a material of construction. Durability is the ability of a stone to withstand the deterioration induced by its exposure, to the action of changing weather and temperature conditions, to the chemical agencies in the moisture of the atmosphere and to the disintegrating action of growing organisms. The normal strengths of the softest building stones are much greater than is necessary for structural purposes, but under the action of the natural elements and agencies just stated they disintegrate more or less rapidly according to their structure and the materials of which they are composed. Granites suffer disintegration chiefly from changes of temperature and are affected but little by the expansion and contraction due to the absorption of water and its subsequent freezing in cold climates, and are almost entirely unaffected by the chemicals ordinarily held in the atmosphere or carried by rain. Limestones suffer even less by expansion and contraction, but deteriorate much more quickly under the action of the chemicals in the air and rain; while the sandstones, on account of their porous structure, suffer chiefly from the effects of expansion and contraction and disintegrate so rapidly from the effects of frost that they are unsuitable for building purposes in countries with cold climates.

As the durability of «life in years» of a given variety of building stone, therefore, varies greatly under different climatic conditions, it is obvious that the engineer and architect cannot be too careful in selecting the stones best suited to the climatic and other conditions of the localities in which his structure is to be built. In order to make the selection intelligently, it is necessary for them to know the special qualities of the various stones, according to their structural constituents, and the natural causes by which those constituents were formed into rocks. The porosity, or the capacity to absorb moisture, of the various classes of stone available for building purposes, varies from ½ to 1 per cent in the granites, 7 to 8 per cent in the limestones and to 8 per cent in the sandstones, and their hardness or resistance depends on the firmness with which the particles of which they consist are bound together. In the igneous or metamorphic rocks, the bond is the result of crystallization, and in the sedimentary rocks it is due to cementation by depositions of silica, etc., between the individual grains as already described. The resistance of a stone to frost action may be conveniently and accurately tested by soaking it in water and then freezing it; the process being repeated a number of times and the amount of disintegration noted.

Artificial Stones.— These are represented by a great variety of artificial compositions of which the basis is hydraulic cement. The best-known varieties are the «Béton-Coignet,» a French production composed of Portland cement, silicious hydraulic cement and clean sharp sand. These constituents when mixed together with a small amount of cold water make a plastic compound which is hardened in molds to the consistency of a stone, very suitable for various building purposes; the «Ransome stone,» which consists of a mixture of sand and silicate of soda, molded into blocks and slabs, is hardened under pressure in a hot solution of chloride of calcium; «Portland stone,» consisting of a mixture of Portland cement and sand, or sand and gravel, rammed while wet and plastic into molds to harden; «McMurtrie stone,» consisting of the Portland stone mixture to which a certain amount of alum and potash soap is added so as to deposit compounds of aluminum in the pores of the stone and thus reduce its porosity. The Portland stone, under various trade names, is extensively used in the United States; the Ransome stone in England, and the French products mostly in the country in which they originated. All of them possess considerable merit for building purposes.

Sand lime brick is increasing rapidly in favor. In its early use in the United States it was often so imperfectly made that readily it absorbed moisture and rapidly deteriorated through weathering. But it was learned that the secret of good sand lime brick lay in forming the brick under tremendous pressure, about 100 tons to a brick being often employed. This produces very solid as well as handsome brick, accurate in form and with good moisture resistance.

Ordinary brick is now artificially colored to many pleasing hues which greatly aid the architect in securing harmonious effects. In large buildings the using of different tints of bricks in groups adds vastly to the appearance. Pressed brick, once favored for fronts, owing to its smooth, handsome surface, is largely in disuse, owing to its tendency to crack.

Terra cotta, which is really nothing but brick of superior quality, tinted and molded to attractive designs, is in greatly increased use, especially for covering steel work, and for ornamental decoration of buildings, inside and out. It is commonly made in blocks, 24 to 30 inches long, and 6 to 12 deep, the height varying with the ornamental design on the face. The interior is usually hollowed, with partitions about 1¼ inches thick.

The use of steel is no longer confined to the skeleton frame of buildings. There are more than 30 factories in the United States making steel doors and shutters, and probably even more making metal lath and steel sashes. Steel and concrete construction is generally replacing wood, brick and stone, in the large cities, and in all important buildings.

The use of various kinds of brick and tile, and of iron, steel and other metals for building purposes, is too familiar to require a detailed account in this connection, especially as they are exhaustively treated under their special titles. It is important to note, however, that during the last decade the tensile strengths of structural iron and steel have been more than doubled by improved processes of manufacture, and they have almost entirely supplanted wood and stone in those portions of large structures which are subjected to the greatest strains, and also where economy of space is of vital importance.

For further detailed information relative to the production and strength of various kinds of building materials, and the specific purposes for which they are most suitable, see ARCHITECTURE; BRICK; CEMENT; CONCRETE; CONCRETE CONSTRUCTION; IRON; LUMBER INDUSTRY IN THE UNITED STATES; MASONRY; STEEL; TIMBERLANDS; WOOD; and special articles on GRANITE; LIMESTONE; MARBLE; SANDSTONE; MASONRY; STRENGTH OF MATERIALS.

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RICHARD FERRIS,
Editorial Staff of The Americana.

BUILDING STONE. See BUILDING MATERIALS.

BUISSON, bwē-sōn̄, **Ferdinand Edouard,** French educational administrator: b. Paris, 20 Dec. 1841. After completing his studies at Paris he went to Neuchâtel, Switzerland, where he taught from 1866 to 1870. His appointment by Jules Simon in 1871 as inspector of elementary schools caused much agitation on account of his advocacy of the secularization of the schools. The opposition of the Church party led to his resignation. In 1873 he was sent to the exposition in Vienna, to represent French educational interests; in 1876 he went to Philadelphia on a similar mission, and in 1878 was in charge of the educational section of the Paris Exposition. In 1879 he was made director of elementary instruction and became prominent through the reforms introduced during his administration. After resigning from his post in 1896 he accepted the professorship of pedagogy in the *Faculté des Lettres.* His strong stand on the Dreyfus question attracted much attention. He is the author of an authoritative ‘Dictionary of Pedagogy’ (1882–84), and has also written ‘Liberal Christianity’; ‘Orthodoxy and the Gospel in the Reformed Church’; ‘The Teaching of Sacred History in Primary Schools’; ‘Duties of American Scholars’; ‘Pedagogical Lectures and Talks,’ and a life of Sébastian Castellion.

BUKOWINA, boo-kō-vē′nạ («beech land»), Rumania, a province in the extreme north of the kingdom, surrounded by Galicia, Russia, and Moldavia. Area, 4,035 square miles. It is traversed by offsets of the Carpathians, culminating at 6,077 feet; gives rise to many rivers flowing toward the Black Sea, and abounds in wood and considerable mineral riches. Pop. 800,098.

BUL-TSO («borax lake»), Tibet, a lake situated 100 miles northwest of Lhasa. It has an area of 24 square miles.

BULACAN, boo-lä-kän′, Philippines, a town in Luzon, about 22 miles northwest of Manila, with which it is connected by railway. The town is composed mainly of native huts, although there are factories in which silk matting is made. Sugar-boiling is also an industry of importance. The place has strategic advantages so that it became a theatre of military operations after the Spanish-American War. It was fully pacified in 1900 and made a military post by the United States authorities. Pop. about 14,000.

BULAK, boo-läk′, or **BOULAK,** a town on the Nile; the port of Cairo and a northwestern suburb of that city, with which it is connected by an electric tramway. Its site was once an island, but that part of the river which separated it from Cairo has been filled up. It lies right opposite the island of Gezireh-Bulak. It was founded in 703; burned by the French in 1799, and rebuilt by Mehemet Ali. In 1835 an arsenal and arms factory were established there and are still in operation. There are also several mosques, an iron-foundry, a paper-mill, a school for languages, a female penitentiary and a custom house. The town is surrounded by the country residences of numerous Egyptian pashas and other grandees. From 1864 to 1889 the Museum of Egyptology was in Bulak; it is now removed to Gizeh (q.v.) Of great interest and importance is the famous printing establishment — the greatest in the Orient — founded by Mehemet Ali in 1822. Here an enormous quantity of Arabic, Turkish, and Persian writing of literary character has been published, as well as Arabic newspapers. Pop. about 78,000.

BULAMA, boo-lä'ma, an island on the west coast of Africa, one of the Bissagos. It is 18 miles long and nine broad and is situated about two miles from the mouth of the Rio Grande. It is very fertile, but not easy of access. It is now occupied by the Portuguese. See BISSAGOS.

BULAN, boo-län, Philippines, a town of the province of Albay, situated in the southeastern part of the island of Luzon. Pop. about 11,000.

BULAU, boo'low, or **TIKUS**, tī'koos, an animal of the mole family (*Talpidæ*) and genus *Gymnura* (*G. rafflesii*), a native of Sumatra and Malacca, bearing a considerable resemblance to the opossum. The body is about 13 inches long and the tail about nine. It is nocturnal and feeds on insects. The muzzle is much prolonged and the fur is long and white mixed with stronger bristly black hairs. The tail is naked. It is savage and morose and will live but a short time in captivity. It is possessed of glands which secrete a kind of musk, but in spite of this, it is relished as food by the natives.

BULAWAYO, boo-lä-wä'yō, Rhodesia, the principal town and chief commercial centre of Matabeleland, South Africa, 490 miles northeast of Mafeking, 1,360 miles from Cape Town, with which it is connected by railroad. It has several hotels, good business blocks and residences, banks and telephone service and is rapidly growing in size and importance. A few years ago it was the chief town of the Matabele tribe, though only a collection of rude huts, in an enclosure of wattles, whose inhabitants were savages of the lowest type. The royal kraal is now replaced by the government house, which communicates by an avenue a mile and a half long with the town proper. Pop. (white) about 5,000.

BULB (Greek Βολτός), meaning bulbous root, the name given to a leaf bud belonging to certain perennial herbaceous plants, and particularly to the monocotyledons. It is usually underground, and is supported by a kind of solid and horizontal plate lying between it and the true root. To this flattened portion the fleshy scales of which the bulb is externally formed are fixed by their base. The interior contains the rudiments of the flower-stalks and leaves. The outermost scales are thin and dry like paper, but they become more fleshy and succulent in the interior. Sometimes the scales are of one piece, a single scale embracing the whole circumference of the bulb, as in the onion and the hyacinth. They are then named «coated» or «tunicated» bulbs. At other times the scales are smaller and free at the sides, and cover one another only in the manner of tiles on a roof, as in the white lily. Lastly, the coats are sometimes so close as to be confounded together, so that the bulb seems as if formed of a solid and homogeneous substance. Such bulbs are called «solid,» and they are exemplified in the common saffron. Bulbs again are either «simple,» as in the tulip or squill, or they are «multiple,» or formed of several small bulbs collected under the same envelope, as in garlic. Bulbs are reproduced every year, but differently in different species, the new bulbs sometimes being formed in the centre, sometimes at the side, sometimes above, sometimes below the old bulbs. The bulb is usually found in short season plants, and is especially adapted for quick growth.

BULBUL, bül'bül, a small brilliantly plumaged thrush-like bird of the family *Pyononotidæ,* species of which are found in Persia, India and other portions of Asia and in South Africa. The South African bulbul (*Pyononotus tricolor*) is remarkable for becoming intoxicated by syringa berries and similar fruits, when it is easily captured and caged. The common Indian bulbul (*P. Hæmorrhous*) is a familiar and favorite bird of European residents, and often builds its nest in their gardens and on the verandas. The pugnacity of the males is utilized by the natives for their amusement, the birds being caught and trained to fight for small prizes. The name «bulbul» was applied to the little Persian nightingale and first introduced into English poetry by Lord Byron, after which its praises were much sung by the poets of the day.

BULFINCH, Charles, American architect: b. Boston, 8 Aug. 1763; d. there, 15 April 1844. He was graduated from Harvard in 1781, for several years traveled in Europe, studying architecture, which he adopted as a profession upon his return in 1786. His first work was the present memorial column on Beacon Hill, Boston. In 1793 he built the first theatre in Boston. In the course of his career he designed more than 40 churches and public buildings in New England. Among them were the State house, Suffolk . County courthouse, Massachusetts General Hospital; he remodeled Faneuil Hall in Boston; the State prison and MacLean Asylum, at Charlestown; the county jail and University Hall in Cambridge, and the State house in Augusta, Me. From 1817 until its completion in 1830 he was the architect of the national capitol at Washington. Consult Bulfinch, Ellen, ‹Life and Letters of Charles Bulfinch, Architect› (Boston 1896).

BULFINCH, Stephen Greenleaf, American poet and hymn writer: b. Boston, Mass., 18 June 1809; d. Cambridge, Mass., 12 Oct. 1870. He was a son of Charles Bulfinch (q.v.), a noted American architect, who drew the plans for numerous public buildings. Graduated from Columbian College, Washington (1826), and the University School, Cambridge, Mass., he was ordained a Unitarian minister, and after preaching in Georgia for seven years, Pittsburgh, Pa., two years, Washington, D. C., six years and Nashua, N. H., seven years, he removed to Boston in 1852. Among his published works are numerous religious ‹Poems› (1832); ‹Contemplations of the Saviour› (1834); ‹The Holy Land and its Inhabitants› (1834); ‹Lays of the Gospel› (1835); ‹Communion Thoughts› (1852); ‹The Harp and the Cross› (1857); ‹Honor, or the Slave-Dealer's Daughter› (1864); ‹Manual of the Evidence of Christianity› (1866); ‹Studies in the Evidence of Christianity› (1869).

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